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WESTERN AUSTRALIA

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Edited by
J. A. MALLETT

Articles which appear in the Journal may be reprinted, provided that both the Journal and the authors are acknowledged.

COVER PICTURE
"THE MENZIES BANKSIA"
(Banksia Menziesii R.Br.*)*

A common tree less than 18 ft. tall found generally in the sandy coastal country extending from the Murchison River to King George's Sound. Dwarf forms occur on the open sandplains. The species commemorates Archibald Menzies, surgeon and botanist to Captain Vancouver's expedition of discovery and survey of the northwest coast of America. He also accompanied Menzies on his expedition of 1790-1795, during which King George's Sound was discovered and named, and it was here that this Banksia was discovered.

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Foreword

by the

Hon. C. D. Nalder, M.L.A.,

Minister for Agriculture

The Hon. C. D. Nalder, M.L.A.

Commencing with this issue, "The Journal of Agriculture of Western Australia" will appear as a monthly instead of a two-monthly publication and will incorporate certain changes in presentation which we feel will add to its popularity with our readers.

The monthly Journal will enable more information to be made available to the farmers and stockbreeders of the State in the course of the year and will enable the information to be published at the times when it will be most helpful.

Through articles by the technical staffs of the various divisions and branches of the Department of Agriculture we hope to keep farmers informed of the latest scientific achievements in many farming spheres and to indicate methods by which production can be economically increased.

Mere facts, while highly informative, can make very dry reading however and, realising this, we are making every endeavour to present factual material in a manner which is both attractive to the eye and interesting to the reader.

Through some excellent co-operation by the Government Printer and his staff we are able to produce a Journal which we feel meets these requirements—a publication which is well printed on good paper, attractively laid out and profusely illustrated.

Personally, I feel that the Department of Agriculture of Western Australia has every reason to be proud of its Journal, which has evoked complimentary remarks from many people outside the State.

Despite the extra issues and the recently-increased postage charges, there will be no change in the present policy of making the Journal available free of charge to all bona fide farmers and pastoralists.

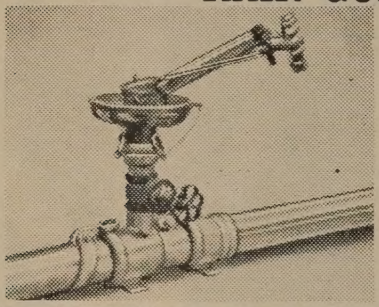
I would suggest that farmers keep their Journals and wherever possible have them bound as a source of reference. A bound volume of the Journals is a valuable asset on any farming property and will repay the cost of binding many times in the course of the years.

C. D. Nalder

IRRIGATE THE FARROWS WAY

with the Farrows . . .

"RAIN GUN"



- This equipment will cover areas up to 3 acres.
- Automatic oscillating permits any section of circle to be watered.
- The equipment is easy to set up, easy to move and simple to operate. It can be used on Farms, Orchards and Gardens.
- Fertilisers, Insecticides and Weed-killers—can also be Distributed with these Guns.

Write for Literature

L. H. RAWLING

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DAY OLD CHICKS AND STARTED PULLETS

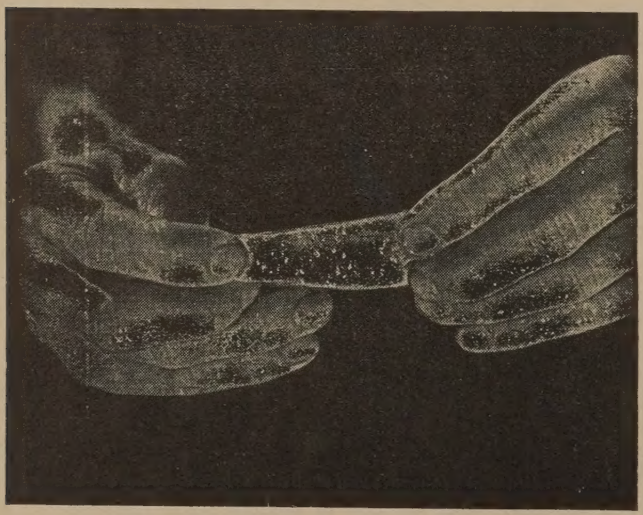
Breeders: Australorp, White Leghorn, First Cross, R.I. Reds.

Our "First Cross Pullets" are your best buy. Proved by Government Random Sample Test. More eggs, more profit per bird.

Hatchery:

Epsom and Smith Avs., REDCLIFFE. 6 5543

Our Own Poultry Breeding Farm:
BERKSHIRE ROAD, FORRESTFIELD



your WOOL is safe in our hands

GOLDSBROUGHS

HOLD ON TO YOUR EGG Profits

By J. A. HOY, Poultry Inspector

IN recent years, much sound advice has been made available to poultry farmers to assist them in developing their properties and operating them on profitable lines. Much of this advice has been utilised to good advantage, but there are still many properties on which the profits are being reduced by feed wastage, damage by rats and mice, lack of sufficient attention to egg quality, unnecessarily high labour costs and failure to keep farm records.

There are other factors which can pare down the profits, but let us take a look at those listed, as they are among the most common causes of reduced income.

FEED WASTAGE

Have you ever paused to think how much profit you are losing through food (which you pay good money to obtain) being trodden into the litter instead of being eaten by the birds?

Most of the wastage is due to badly-designed feed troughs or hoppers. A well-designed waste-proof feeder is a good investment, irrespective of whether it is bought ready-made or put together on the property. Conversely, a feeder that encourages waste is cutting down your profits every hour that it is in use.

A bad practice on many farms is over-filling of the feed-troughs or hoppers—and you will be surprised to know what such a practice can cost you.

A test conducted on a research farm in Canada showed that, when the hoppers were filled to capacity, 29 per cent.—or more than a quarter—of the food was wasted.

In the test all spilt feed was measured by allowing it to fall into a trap. The hoppers were filled to various levels and allowed to become empty before more feed was added.

When the hoppers were only filled to two-thirds of their capacity, the wastage was just under 7½ lb. for each 100 lb. of feed. Half-filled, the wastage was reduced to just over 2 lb., and when the hoppers were only filled to one-third of their capacity, the wastage was less than 1½ lb. for each 100 lb. of food.

What does this mean in cash losses? For a start, let us suppose that you are paying say £30 per short ton for your feeding-stuffs. This works out at a shade over 3½d. per lb., so if your birds are wasting 29 per cent. of the feed—or 29 lb. out of every 100 lb.—you are losing about £8 10s. on every ton of feed used. Even on the much lower wastage figure of 7½ lb. per 100 lb., the cost would be around £2 4s. per ton.

There are possibly quite a number of poultry farmers with feed wastage somewhere around the 7½ lb. figure, so let us approach that subject in another way. Assuming that you have a flock of 1,000 layers that are getting about 480 lb. of feed daily, you are losing each day about 21 lb. of feed valued at 6s. 3d.—or a loss of £2 3s. 9d. a week.

Supposing this 1,000 birds are in 50 per cent. lay producing say 42 dozen a day or 294 dozen a week, your feed wastage is reducing egg profits by about 1¾d. per dozen.

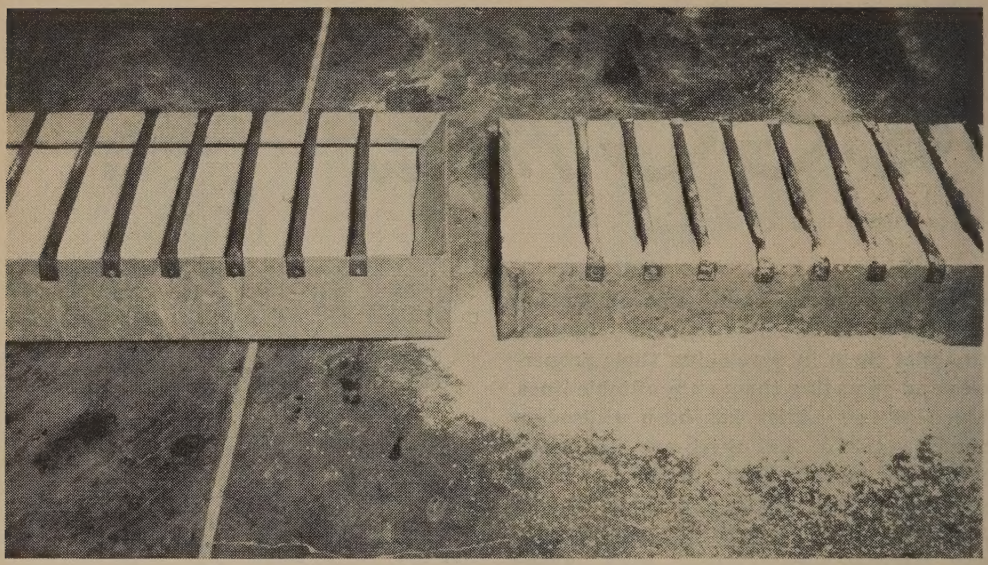


Fig. 1.—Over-filling of troughs leads to waste of feed. The trough on the left was only filled to about two-thirds of its capacity. That on the right was filled to the brim, with the result that a high degree of wastage occurred

Making worthwhile profits is not easy at any time, so why make it harder by allowing food wastage to continue when a little thought and labour could reduce the losses?

Check up on your outdoor feeders too. Make sure that they are rainproof and in sheltered positions where feed is not blown away. We have no figures for feed losses caused by wind—but such losses can be very costly.

CONTROL OF VERMIN

A lot of money can be lost through the incorrect storage of feed in the feed shed. Rats and mice are a constant menace and will do untold damage to sacks and feed unless the farm cat is helped in its hunting by stacking the feed in small sections so that the cat has access to various parts of the stack. Vermin can be the equivalent of "a thief in the night" eating into the profits and a poultry farmer cannot afford losses of this nature.

The advantages associated with the storing of feed on a slatted platform at least 12 in. from the ground should not be overlooked. This allows the cat to get under the feed stack and some ventilation is assured which helps to keep the food dry. Also if rain enters the shed the bags and their contents are not in danger of rotting by being allowed to lie on the damp floor.

LOSSES ON EGG COLLECTION

Further losses can result from the overloading of egg baskets. How convenient it is to pack those last few dozen eggs onto an already overloaded basket—causing "spider cracks" and converting some of the top price eggs to less than half their original value.

The incidence of "spider cracks" is much too high on some farms and this class of egg, which is not detected until it is candled on the Egg Floor, is graded as second quality and returns less than half its original price.

While on this subject let us investigate some of the advantages to be had from packing the eggs direct from the nest into Keyes fillers. This is not possible on all farms because of farm layout and shed design, however, provision for filler collecting should be made when it is planned to house a considerable number, say 1,000 or more additional layers.

This method of collecting eggs has two distinct advantages over basket collections. In the first place a considerable saving of time can be achieved and secondly, by

eliminating double handling of the eggs, "spider cracks" can be considerably reduced and many second quality eggs avoided.

Some time ago a commercial poultry farmer co-operated with officers of the Department of Agriculture to ascertain the saving that could be made by collecting eggs direct into fillers as opposed to collecting them into baskets.

At that time the farmer was collecting 1,800 eggs daily. The laying pens and openings to the nests faced on the passage-way, and the test consisted of collecting the eggs into egg baskets for six weeks followed by collection of the eggs direct into Keyes fillers for six weeks, followed by a period of two weeks during which the eggs were again collected into baskets.

During the first period in which the eggs were collected into baskets, 4.93 per cent. of them were graded as second quality.

When filler collecting was introduced this figure dropped to 2.96 per cent. and upon returning to basket collecting the percentage rose again to 4.50 per cent.

The reduction in the incidence of second quality eggs brought about by the collection of eggs direct into the fillers resulted in a saving of approximately £2 10s. a week in this instance.

In addition the time spent on collecting, cleaning and casing the eggs ready for market was cut in half down to the extremely good figure of 18 minutes per 30 dozen case packed ready for market. It is suggested that you compare your own time with this figure.

It is obvious that there are many other features relating to the preservation of egg quality but these have been dealt with from time to time in other leaflets.

Whilst on the subject of packing eggs into fillers directly or otherwise I would stress the importance of removing the sawdust which sometimes adheres to the eggs. The "Ben Nevis" egg grading machines recently installed at the Western Australian Egg Marketing Board's floor, work on a suction principle and any sawdust adhering loosely to the large ends of the eggs is drawn into the suction tubes. At intervals these tubes have to be dismantled and cleaned. The time taken in this operation naturally reduces output and is a charge on the industry. Furthermore the suction is sometimes lost due to the sawdust, with the result that some eggs are not lifted by the suction cups and these eggs remain on the fillers.

When the filler is automatically discharged from the machine any eggs that are left behind could get broken so that the farmer would lose on these eggs.

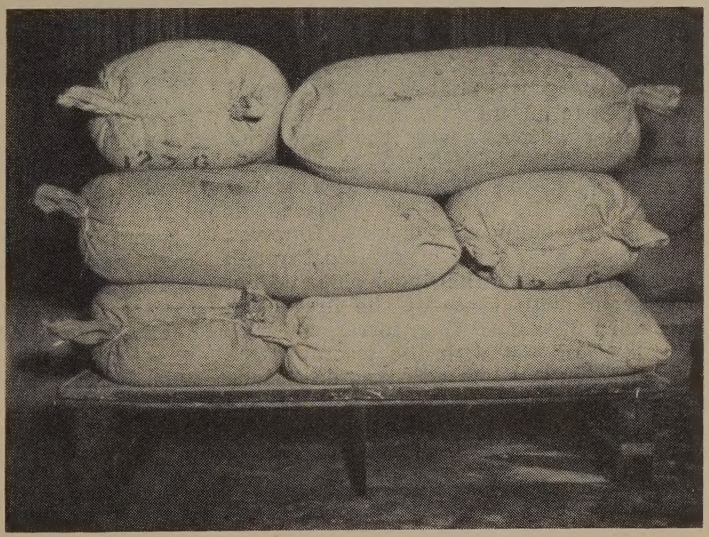


Fig. 2.—Feed storage on the lines of that shown here will reduce wastage by rats and mice. The raised platform and small stack allow the farm cats to move freely around the feed shed and prevent vermin from breeding unchecked

Poultrymen are therefore strongly advised to co-operate with the Egg Board in this respect. A gentle but firm dusting over the tops of the eggs in the fillers with a fluff duster will assist in this matter. Recourse to the use of steelwool will be necessary where the sawdust sticks firmly to the shells. Eggs which require individual cleaning should be put aside in separate fillers at collection time so that they can be cleaned back in the egg room. Soiled eggs are likely to be left on the fillers in the same way as those which have sawdust adhering to them.

Another point of which farmers should be aware, is that the Ben Nevis grading machine will only take fillers which are the right way up. That is, the eggs must only be packed into the smooth side of each filler with of course the large ends uppermost.

In packing the egg case, it does not matter how the first filler is placed, as long as the shiny side is up. However, the second filler must be rotated through 90 degrees so that the finger grips do not correspond with those of the first filler. The third filler must then correspond with the first and not with the second. Each filler is alternated in this way until each section has it full number of 6 fillers (15 dozen eggs). The empty flat is then placed on the packed sixth filler so that the flat surface is uppermost and adjacent to the lid.

This procedure should be adopted whenever eggs are cased. Eggs should never be packed into the rough side of fillers and the finger grips on any two adjacent fillers should never coincide.

WORK EFFICIENCY

It is an old business adage that "time is money." How evident this becomes when one spends a few minutes looking at some of the routine jobs carried out on a poultry farm and notes the time that could be saved if attention was given to organising these jobs on a proper basis. It does not matter whether you carry 200 or 2,000 birds—there is always a possibility of saving time by a reorganising of chores.

A general appraisal of the farm work should be made with the object of cutting out any of the "dead wood." It is surprising how certain work on the poultry farm can become habit forming until the farmer suddenly realises that the same work can be carried out much more easily by adopting a different approach.

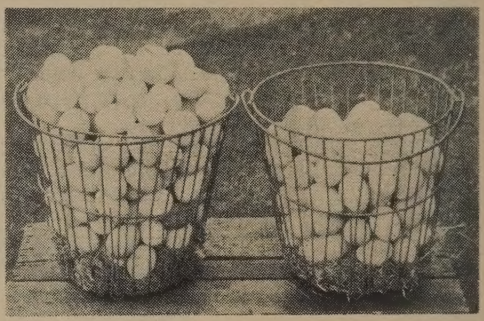


Fig. 3.—The basket on the left is carrying too many eggs. A number are liable to develop "spider-cracks" and will be graded as second-quality at lower prices. The desirable packing level is shown at the right. Note the three or four-inch layer of woodwool in the bottom of the baskets

What are some of the features of a well-organised farm? Well one way of saving a great deal of time is to have a well-maintained Kikuyu grass lawn, the clippings from which are fed to the birds direct from the mower. An area of half an acre will grow sufficient green feed for 2,000 laying hens throughout the year and a sprinkling of clover seed broadcast throughout the lawn area will ensure a steady rate of cutting during the winter months.

Another means of saving time and labour is to place more broody coops (if not already in the sheds) in convenient places and as close to the nest-boxes as possible. If the work of handling the broody birds is made easier your broody hens are likely to receive better attention and will therefore return to the lay quicker.

The saving that can be achieved by packing eggs direct from the nest into Keyes fillers has been explained previously and many other examples of how time can be saved on the farm could be given.

During their visit to the United States of America in 1956 the three members of the Australian Poultry Study Team, namely Messrs. A. G. Bollen; A. A. McArdle; and R. H. Morris, paid attention to ways and means of saving time and work on the poultry farm and in their report entitled "An Investigation of the

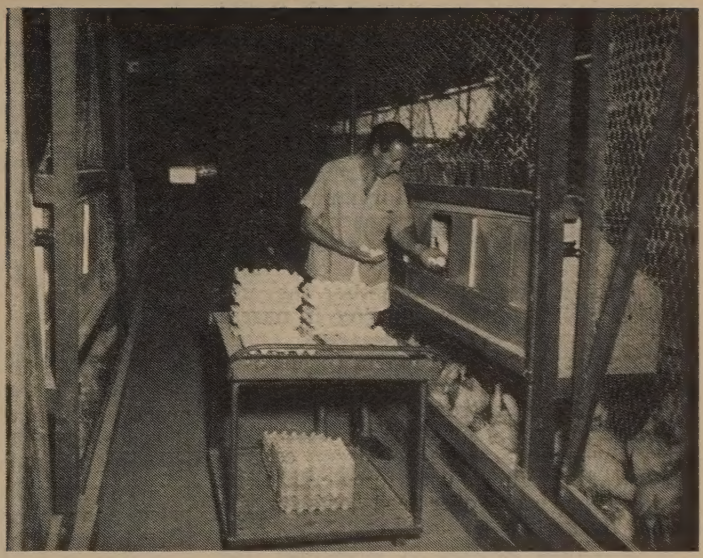


Fig. 4.—A poultry farmer who is continually looking for means of saving labour and reducing production costs is Mr. P. Turner, of Waterloo. Here he is collecting eggs and putting them direct from the nests into Keyes fillers

Commercial Poultry Industry in the United State of America—1956" they wrote:—

Dr. S. A. Hart, of the University of California points out that travel takes time, and that reducing travel reduces labour. He considers that the combination of two operations, is one of the best methods of cutting labour costs.

Dr. A. D. Reed, of the same University, considers that the most efficient use of labour is determined by the arrangement of buildings. This view was supported by a visit to a farm where the operator had obtained the services of a "time and motion" expert. He had found that, by changing the position of the laying sheds and using an electric cart, he could reduce the amount of labour per bird and increase the size of his flock from 3,000 to 4,300 layers without increasing his labour force. However, it is considered equally important for the internal shed layout in respect of feeding and egg collection to be such as to reduce time and effort to a minimum.

After an exhaustive study of labour-saving devices, work arrangement and simplification, the following points were recorded as worthy of consideration in reducing labour costs.

(a) Combine different operations wherever possible.
(b) Make the birds lay at convenient pick-up points.
(c) Reduce the number of times each egg is handled.
(d) Ensure that buildings are conveniently placed to reduce travel.
(e) Start a new operation where the previous one ends.
(f) Use a trolley or mono-rail carrier to reduce the number of trips.
(g) Use a trolley or carrier large enough to complete a circuit without having to reload halfway around, so avoiding "back-tracking."
(h) Have sheds of reasonable length to make full use of a trolley or mono-rail carrier.
(i) Haul maximum loads.
(j) Have doors and paths the proper width and surface.
(k) Look at each operation and decide:
    (i) Is it really necessary?
    (ii) Can it be simplified?
    (iii) Is it being done in the right order?

From a business angle, any saving of time on everyday chores should give the farmer more time to study his birds which are his profit makers.

RECORD KEEPING

At this juncture it would not be out of place to touch on the subject of record keeping on the farm. It is a fact that very few poultry farmers (including some of the best managers) keep records of their production in a manner which could be of real use to them thoughout the year.

Whilst it is appreciated that poultry farming is a seven-day-a-week job, it still behoves a progressive farmer to keep at least a simplified form of easy-to-read records or production figures from his various pens and finally on the whole flock (see specimens at the end of this article). The laying house record, kept preferably in the pen itself will give a farmer a good insight into the daily performance of the flock and is often the means of keeping him in touch with the "weak spots" in particular pens. For instance a carefully-kept record indicates whether or not further culling and/or grading is necessary.

The gross profit for the farm (profit over food costs) can be derived by keeping a record of figures extracted from egg certificates and food consumption data. In brief, the average price per dozen eggs is the key figure and is used to calculate the weekly gross profit over feed costs for the laying flock.

A simplified method of obtaining this information is appended (see Farm Record Sheet), and when completed each fortnight will provide the farmer with complete figures for the year on his flock. The farmer holding a permit to sell eggs privately must of course, include these sales when estimating the average price per dozen he receives for his eggs after deducting Egg Board charges.

It must be remembered that the amount shown on the Egg Board cheque is for eggs delivered to the Board for the fortnight prior to the week in which the cheque is received.

During this waiting period your production figure may have changed considerably and to obtain a more up-to-the-moment profit figure you should calculate the number of dozen eggs produced for the current week and use the last average price per dozen, as calculated from the previous Board certificates. The value of the eggs obtained is then used to determine the profit or loss for that week. Should a price change occur during this waiting period simply make an allowance for this.

Each of the specimen record sheets shown, is intended to occupy one sheet of foolscap paper.

PEN RECORD FOR CHICKENS

Week Commencing ..... Pen No. .....

Breed ..... Date Hatched .....

Number of Birds carried over from previous fortnight .....

Day	Destroyed	Deaths	Remarks
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Totals			

Number of Birds, week ending Saturday .....

CHICKEN REARING RECORDS FOR FLOCK

No. of Chickens Started..... Breed.....

Rearing Pen Nos..... Hatched on.....

Weeks	Date (Week Comm.)	Daily Wastage							Total Weekly Wastage	No. Surviving at end of week	Remarks
		Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.			
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											

Summary

Number Started.....

Number Survived to 22 weeks..... (%).....

Wastage (Number)..... (%).....

Number Sold..... Pullets..... Cockerels.....

LAYING HOUSE RECORD

Week Commencing..... Pen No. .....

Breed ..... Date Hatched.....

Number of Birds carried over from previous Sheet.....

	Egg Collections				Birds			Transfers		% Lay	Remarks
	1st	2nd	3rd	Total	Culls	Dead	Broodies	+	—		
Sunday											
Monday											
Tuesday											
Wednesday											
Thursday											
Friday											
Saturday											
Total											
Sunday											
Monday											
Tuesday											
Wednesday											
Thursday											
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Thursday											
Friday											
Saturday											
Total											
Sunday											
Monday											
Tuesday											
Wednesday											
Thursday											
Friday											
Saturday											
Total											

Number of Birds carried over from the fourth Saturday.....

HISTORY SHEET FOR LAYING FLOCK

Breed—First Cross. Hatched—18th August, 1958.

No. Started—475.

Number Reared to 22 weeks—447 (93·9%).

Mortality—28 (6·1%).

Number Sold—*Nil.*

First Egg Laid on 12th January, 1959 (22 weeks).

Number Housed—447. Housed in Pens 6, 7 and 8.

Weeks	Date week commencing	Eggs				Progressive						Hen-housed figure	% Lay	Culls	Deaths	Prog. Wastage		No. of Layers
																No.	%	
23	19/1/59			3	7					3	7	0·08	1·2					447
24	26/1/59			9	7				1	3	4	0·3	3·1					447
25	2/2/59		2	5	7				3	9	1	0·9	8·2					447
26	9/2/59		6	4	6			1	0	3	7	2·3	20·6					447
27	16/2/59	1	0	5	6			2	0	9	3	4·7	33·7					447
28	23/2/59	1	3	0	4			3	3	9	7	7·6	41·7					447
29	2/3/59	1	4	9	8			4	8	9	5	11·0	47·9		1	1	0·22	446
30	9/3/59	1	7	8	8			6	6	8	3	15·0	57·3					446
31	16/3/59	1	8	9	7			8	5	8	0	19·2	60·9	1		2	0·44	445
32	23/3/59	1	9	6	4		1	0	5	4	4	23·6	63·2		1	3	0·67	444
33	30/3/59	2	0	2	1		1	2	5	6	5	28·1	65·2	2		5	1·12	443
34	6/4/59	2	0	5	9		1	4	6	2	4	32·7	66·7					441

FARM RECORD SHEET

Date Board Cheque and/or Cash (Private Sales) Received	Information from Egg Dockets												Approximate Feed Cost for Layers*	Approximate Feed Cost for Chickens	Gross Profit or Loss over Feed Costs		Average No. of Layers	Per Cent Lay Flock
	Total Dozen Sold	Gross Amount Received	Deductions		Nett Value of Eggs		Export	Export	Local	Local	Local	Second Quality			£** +	£ —		
			Total	Rate per dozen	Total	Average Price per dozen	16 lb.	14 lb.	16 lb.	14 lb.	12 lb.							
Covering two weeks	584	£ s. d. 131 8 0	£ s. d. 14 12 0	s. d. 6	£ s. d. 116 16 0	s. d. 4 0	Doz. 350·8	Doz. 116·8	Doz. 23·4	Doz. 11·8	Doz. 70·0	Doz. 11·8	£ 60	£ *nil*	56 16 0		1,000	% 50
	....	....	....	....	....	....	% 60	% 20	% 4	% 2	% 12	% 2	....	....	....	....	....	....

* To obtain this figure without referring to invoices for feed, assume that 1,000 laying birds will consume approximately two tons of feed in two weeks and use prevailing prices.

** The gross profit over feed costs is obtained by subtracting the cost of the food from the net value of the eggs.

Example : Assuming that there are no chickens on hand, one thousand laying birds in two weeks will consume two tons of feed costing £60 and when laying at a 50% rate with eggs netting 4s. a dozen, will return £116 16s., thus :—

	£	s.	d.
584 dozen eggs at 4s. per dozen	116	16	0
Cost of feed	60	0	0
Gross Profit (over feed)	£56	16	0

★ *Some sound practical advice concerning*

DROUGHT FEEDING OF SHEEP

from a broadcast talk by

L. C. SNOOK, Animal Nutrition Officer

WHEN this talk on drought feeding of sheep was suggested conditions were very serious over large tracts of pastoral country. Many stations had not received a worthwhile rain for over 12 months and it appeared that grazing animals would have to be fed if they were to survive. Requests have been received for advice on the cheapest way to keep sheep alive. Drought feeding in any form is a gamble. There is always the risk that the stock will eventually die despite the consumption of much costly feed. It follows that if an effort is to be made to save a selected portion of the flock, the job must be done properly if unnecessary waste is to be avoided. On many stations, fortunately, useful rains have fallen since this talk was prepared. These rains will save many thousands of sheep. Certainly, the need to commence hand feeding will in many cases be postponed, if not eliminated.

Even so, a discussion of the difficulties associated with drought feeding, along with a few suggestions, may not go amiss. If a pastoralist knows what should be purchased and the quantities which have to be fed, it will be easier to work out likely costs and then decide whether feeding is justified.

GRAIN ALONE WILL SUFFICE

Take the extreme case when all natural herbage has been eaten and lean sheep face starvation. Under such circumstances the animals require an easily-digested source of energy. Cereal grains are the best source of this energy. Roughage in the form of hay is NOT required. This fact deserves special emphasis as many stockmen still believe that sheep and cattle must have a certain proportion of coarse feed. This is not so, as was shown very clearly in a drought-feeding trial carried out in the Victorian mallee in 1943. In this trial one hundred Merino ewes were kept in a small bare paddock for eight months. The only food was wheat grain fed twice weekly at a rate equivalent to nine-tenths of a pound per head daily. After five months on this meagre ration 81 lambs were dropped of which 51 survived. In due course the ewes were shorn and averaged almost 7 lb. of wool per head. When a drought does break ewes in particular become quite valuable. For this reason alone the feeding of the wheat grain to these ewes paid handsomely. As it happened the lambs and the wool paid for the feed supplied over eight months of drought feeding.

This trial supplies basic information of considerable value to the pastoralist. Thus it shows that Merino sheep can be kept alive for many months on cereal grain alone. Also that the wool and lambs grown during the feeding period can contribute quite a useful sum towards the cost.

CALCULATING COST

Let us apply these results to conditions in our own North-West. Oats are the

cheapest cereal grain available. These can be landed in store at Port Hedland for £28 per short ton. Allowing another £2 per ton for transport to the station, this would bring the cost to 3½d. per pound. Cereal grain, if fed at the rate of a pound per day, should keep a Merino sheep alive for many months even when nothing else is available. In other words, sheep could be kept in bare paddocks in the Port Hedland area for a feed cost of 9s. per month. Given such a figure the pastoralist can decide whether the expense is worthwhile. The feeding may have to continue for six months by which time the cost per sheep would amount to £2 14s. for feed alone. But even this high outlay would be justified to save a good breeding ewe which while being fed would have grown perhaps 4 lb. of wool. And judging by the Victorian results the game pastoralist could mate these ewes in anticipation of some rain next summer.

I have used oat grain in making these calculations because at the present time this is the cheapest source of energy. Wheat is not much more expensive, however, and should always be considered as an alternative. Cost is the main factor to be considered when making a decision whether to use oat, wheat or barley grain —6 lb. of wheat or barley are worth as much as 7 lb of oats.

FEEDING OUT

To many pastoralists the chief worry is not the cost of the grain but the problems associated with feeding out any supplement to stock in pastoral areas. It is all very well for the scientist to say that sheep can be kept alive on a pound of grain daily, if this is fed out once a week in self-feeders. But self-feeders are costly and vermin could eat a large proportion of the grain. Even the initial task of training pastoral sheep to eat supplements is not an easy one. Fortunately, practical men are adept at overcoming difficulties **so long as they consider the effort to be justified.**

Drought feeding necessarily involves a lot of work and careful planning, but there is a wealth of evidence to show that when the job is well done it has paid. Self-feeders may be out of the question but troughs of some sort will save a lot of grain. Possibly if this is fed out at dusk, birds would not have such a good opportunity to eat the grain before the sheep. Control of kangaroos, goats and such like would be essential where sheep are receiving supplements.

CALCIUM SUPPLEMENTS

In all references to the use of cereal grain as sheep feed, attention is drawn to the need for a calcium supplement. The recommendation is made that 2 per cent. of finely ground limestone should be fed with the grain. Cereal grains contain very little lime hence the need for this addition. But here again the advice given puts a severe strain on the practical man. How does he feed 2 per cent. of ground limestone along with the grain? This involves a lot more labour and can increase costs considerably. In any case most of the limestone sifts to the bottom of the trough or is lost on the ground. Fortunately, it is unlikely that the pastoralist need worry about supplying extra lime. The additional calcium is needed by lactating ewes or growing lambs but mature sheep probably have adequate reserves to carry them through a period of drought feeding. Where a little mulga, or similar top feed, is available this will supply ample calcium to correct the deficiencies in the grain.

Where it is considered necessary to feed a lime supplement I suggest that ground rock phosphate should be used rather than ground limestone. The rock phosphate will cost very little more and will supply phosphate as well as lime. Under drought conditions stock in this State are more likely to be suffering from phosphorus deficiency than lack of calcium. Where salt is not expensive it is preferable to feed the mineral supplement as a salt lick rather than go to the bother of mixing this with the cereal grain. A complete mineral supplement could be made by adding 4 oz. of bluestone and one ounce of cobalt sulphate to each hundred pounds of a mixture of equal parts of stock salt and ground rock phosphate.

SHEEP NUTS

Many of the difficulties associated with the feeding of cereal grain are eliminated by the feeding of commercial "nuts." These can be scattered on the ground with less waste and the cubes are too large to be eaten by small birds which eat a lot of

grain. The cubes should also contain all the minerals which are so difficult to add to a cereal ration. These maintenance cubes can be landed in north-west ports at a cost per unit of energy which compare favourably with cereal grains. Pastoralists are advised to check on the comparative costs and ease of feeding.

Where stock are being hand fed never overlook the importance of shade. The survival rate of sheep on a bare maintenance diet can be appreciably increased by the provision of ample shade and cool water. Of more importance, the feed requirements are reduced when the stock can be kept out of the hot sun.

SUMMARY

Where feed is to be purchased to keep sheep alive under drought conditions buy cereal grain or commercial maintenance nuts. Hay, particularly cereal hay, is an expensive and wasteful source of energy. Sheep can be kept for long periods on nothing else than a pound of grain per head daily. At present prices it will cost about 9s. per month to keep a sheep on grain alone in pastoral areas. Commercial cubes can be more easily fed to stock under pastoral conditions and provide a cheap and simple method of supplying essential minerals. Shade and cool water will increase survival rates under drought conditions.

Making Mowing Easier

This stone roller was evolved at the Avondale Research Station. It is nine feet long and three feet in diameter and is constructed from five-eighth inch steel plate. The roller may be filled with water to increase its weight from one and one-half to three tons. Used prior to mowing, it presses stones into the ground and makes close mowing possible on paddocks previously regarded as too rough. The cost of the roller is soon recovered in lower mower maintenance costs, time saved and extra hay harvested.

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APHIDES

By C. F. H. JENKINS, M.A. (Government Entomologist)

THE members of the aphis family are remarkable creatures both in structure and habits. They are practically world-wide in their distribution and despite their small size and apparent fragility they thrive under a wide variety of conditions and are among the most prolific breeders in the animal kingdom.

All the pest species in Australia have been introduced from other parts of the world, and there are only a few rare forms actually native to this continent. The introduced species, however, have thrived so well that they can be counted among the most serious pests with which the gardener and horticulturist have to contend.

Although one species of aphis will often attack quite a wide variety of hosts, generally a single species or group of plants is favoured, thus the different species are known as cotton aphis (*Aphis gossypii* Glov.); cabbage aphis (*Brevicoryne brassicae* (L.)); green peach aphis (*Myzus persicae* (Sulz.)); rose aphis (*Macrosiphum rosae* (L.)); strawberry aphis (*Capitophorus fragariae* (Theob.)); black citrus aphis (*Toxoptera aurantii* (Boy)); according to the particular plant usually attacked.

On account of their delicate structure aphides do not thrive under extreme conditions of heat, or cold, neither do they like heavy rain. This accounts for the fact that in most districts it is mainly in the spring and autumn that heavy aphis plagues appear. No one can observe the occurrence of a severe aphis infestation without marvelling at the astounding rapidity with which the creatures reproduce. This rapid rate of reproduction renders the aphis a particularly difficult insect to combat and means that control measures must be very thoroughly applied if rapid reinfestations are not to occur.

GENERAL DESCRIPTION

Although differing in size and colour according to species, aphides, often known as plant lice, can be easily recognised by their soft delicate structure and other characteristics. They are sluggish in their movements, have rather long legs, and are usually found clustered on the host plants. The wings when present are clear. The abdomen is usually rather swollen and often carries a pair of horns or cornicles from which a sweet honey-dew much prized by ants is excreted.

The mouth parts are produced into a long thin sucking tube, rather like the proboscis of a mosquito, and by means of this thin tube the plant tissue is pierced and the sap imbibed.

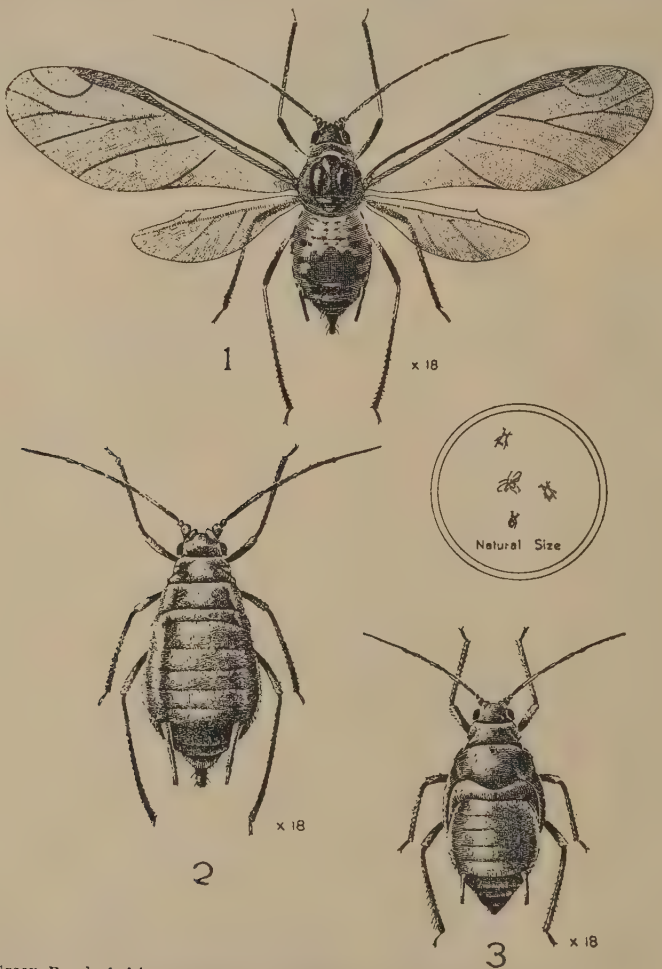
This method of feeding should be carefully noted for it is a knowledge of an insect's feeding habits and mechanism that is most essential in determining control measures.

LIFE HISTORY

In order to understand how the remarkable rate of reproduction is accomplished

it is necessary to have a detailed knowledge of the general life history of the aphis. After examining a cluster of aphides on a rose or cabbage leaf, one will notice that all the insects are not identical. Some are larger than others, some are winged and some are wingless.

rapidly and in a few days can in turn produce more living young. Every now and then, winged females are developed, and have the same unusual reproductive powers as their wingless parents. These fly to other plants and so spread the infestation.



Green Peach Aphis.—Enlarged drawings showing: 1—Winged female (spring form). 2—Wingless female. 3—Nymph or immature winged female. After E. H. Zeck.

The large wingless ones are known as stem-mothers. They are females capable of giving rise to living young without having previously been fertilised. The power to reproduce in this manner is known as parthenogenesis. The young from these parthenogentic stem-mothers grow

In cold countries, as winter approaches, male and female aphides are developed, and fertilised eggs are laid on the host plants. These eggs last over the winter and give rise to stem-mothers next spring.

In Western Australia it is doubtful whether the weather is ever severe enough

to bring about egg-laying, and the insects carry over from one season to another by means of the few females which survive in sheltered spots.

Colonies of aphides on cabbage leaf
—Photo., U.S. Dept. of Agriculture

The life history of many aphides in Europe is complicated by the inclusion of alternate host plants into the cycle, or by a migration of the population to a subterranean life on the roots. Two local species, the black peach aphis (*Anuraphis persicae-niger* (Smith)) and the woolly aphis (*Eriosoma lanigerum* (Housm.)) have root-infesting forms but the relatively simple life history of most Western Australian aphides can be attributed to the mild climate of this State.

CONTROL

Due to the fact that the aphis is a sap-sucking insect and that it does not actually eat the foliage, ordinary poisonous sprays and dusts are useless as controls. On account of the insect's soft and delicate structure, however, contact insecticides are very effective.

Sprays.

Black Leaf 40 or Nicotine Sulphate is still extensively used for the control of aphis although it is being supplanted by the newer organic phosphates such as Hexone, Parathion, Malathion and the systemic insectides. The formula recommended for Nicotine Sulphate is as follows:—

Nicotine Sulphate—1¼ pints (2 teaspoonfuls).
White Spraying Oil—1 gallon (3 tablespoonfuls).
Water—100 gallons (1 gallon).
Soap—4 pounds (1 ounce) may be used instead of white spraying oil.

(The quantities shown in brackets are those which may be used conveniently for small quantities of spray.)

When citrus and other hardy trees are requiring treatment the White Oil strength may be increased from 1:100 to 1:40. Such a concentration will also prove effective against most scale insects found infesting oranges and lemons.

New Insecticides.

Under this heading may be grouped DDT, Benzene-hexachloride (BHC) or Gammexane, HETP or "Hexone" (Hexaethyltetraphosphate), Parathion or E.605 ("Folidol" and "Phosphone") and the systemic insecticides ("Systox" and "Metasystox").

Of the list outlined, Hexone, Malathion and Metasystox are probably the most generally useful against aphis.

The use of DDT for aphis control is not to be recommended except under special circumstances as the insecticide kills many useful parasites and may lead to an increase in some scale insects and mites. Where for any reason DDT is desired for aphis control, emulsion types are recommended. Several workers have reported them superior to the wettable powders and the concentration suggested is 0.1 per cent.

A combination of insecticides particularly useful to market gardeners is a dust consisting of 2 per cent. DDT and 2 per cent. BHC. The former satisfactorily controls chewing insects such as cabbage caterpillars and the BHC reduces the aphis population.

Black peach aphides on peach shoot
—Photo., British Ministry of Agriculture

Hexone and Parathion were both developed during the war to alleviate a world shortage of nicotine sulphate and have proved most effective substitutes for the tobacco extract.

Systemic Insecticides.

The systemic insecticides depend for their efficiency on the fact that the materials enter the sap stream and accumulate in the vigorously growing portions of the plant. Systemic materials may be sprayed on the foliage or watered around the roots. They are extremely selective in their action and, of course, only affect sap-sucking insects. This is of great importance as it allows ladybirds and wasp parasites to go unmolested and continue their work of scale and aphis control.

One of the most readily available systemic insecticides on the local market is Metasystox which has been effectively used for the control of aphis and various mites.

Young peach leaves showing the characteristic curling and distortion caused by aphides feeding on the under-surfaces

Safety Precautions.

The insecticide group (organic phosphates) to which Hexone, Parathion and Metasystox belong is very toxic to the higher animals and so must be used with great caution. Gloves should be worn when mixing the sprays to prevent any concentrates coming into contact with the bare skin. When spraying, precautions should be taken to see that the spray mist is not inhaled and that clothing does not become saturated with spray liquid. Although a very effective contact insecticide, Hexone has little residual effect and the toxicity deteriorates rapidly once it is diluted and exposed to the air. Parathion

on the other hand has an appreciable residual action and also some of the properties of a systemic insecticide. This renders Parathion the more dangerous of the two preparations and means that it should not be applied to fruits or vegetables later than a month before picking.

Biological Control.—There are many excellent examples of the biological control of aphides. Ladybirds feed readily upon most species, and a number of tiny wasps lay their eggs into and develop within the aphis. The cabbage aphis is one variety largely controlled by a wasp parasite introduced into this State in 1907.

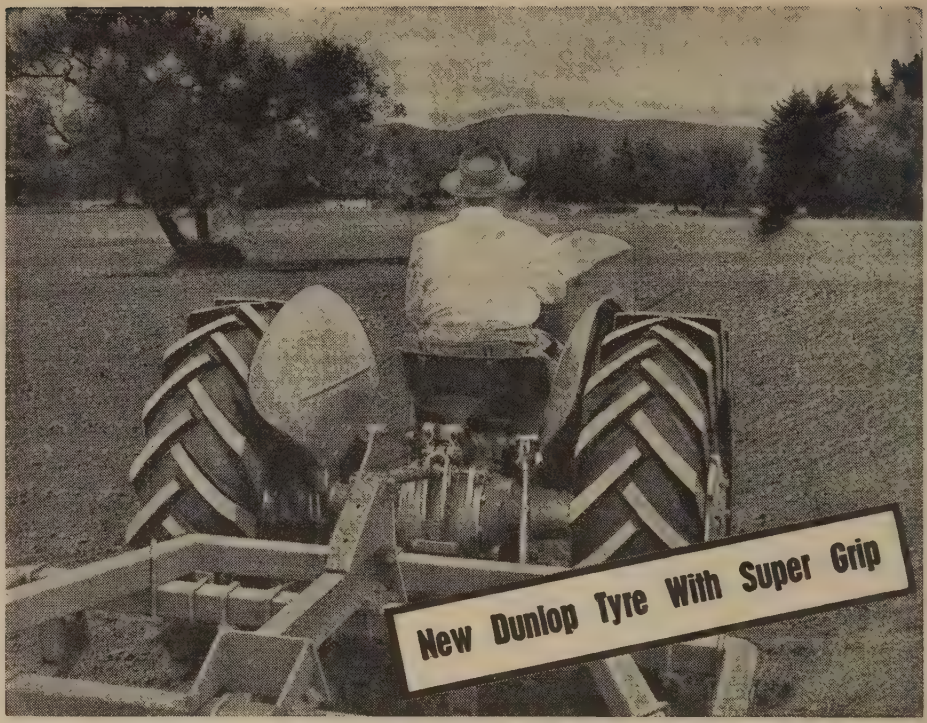
The parasitised aphides may be distinguished from the healthy insects by their bloated appearance and light colour, and later by the tiny hole in the back from which the wasp has emerged.

Cultural Methods.—All weeds likely to harbour aphis should be destroyed and especial attention given to weeds closely related to the crop being grown. For instance, wild radish and wild turnip will harbour cabbage aphis, and may easily be responsible for starting an outbreak in a commercial crop.

When cutting cabbages and cauliflowers the whole plant should be destroyed, so that the butt is not left to breed further pests. Similarly when any crop is finished the old plants should be got rid of as soon as possible, for carelessness in this direction leads to the dissemination of diseases and insect pests of all kinds.

Producing Seed for Future Pastures

Visitors to a field day at the Wokalup Research Station inspecting bulk plots of pasture grasses. New strains of pasture plants are tested in the grass garden, and those proving suitable are grown in the bulk plots to provide seed for distribution.



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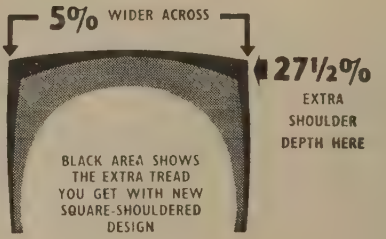

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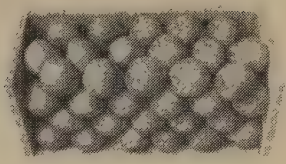

Pears packed in the half-dump case. This case is also proving popular for lemons and mandarins

By J. BLOOMFIELD, Senior Packing Instructor

ONE of the first cases used for the marketing of citrus fruit in Western Australia was the "flat bushel," which is similar in size to the "long bushel" used extensively for pears in Victoria. In a bulletin on fruit packing and the marketing and exporting of fruit issued in 1915, the flat box was illustrated and recommended as a suitable container for the local market. This case was superseded by the "dump" case when the Harvey area came into production about the beginning of World War I.

The "¾-flat" was then later adopted for packing the smaller-sized citrus fruit, namely lemons and mandarins, and was also used extensively for stone fruit. Western Australia is the only State where the "¾-flat" box is used. Since the early days it has been the general practice to pack lemons, mandarins and pears, as well as stone fruit and tomatoes for the local market, in the "¾-flat." This box, because of its construction, may offer some protection to the softer and riper stone fruit and tomatoes, but this does not offset its many disadvantages in packing and handling generally.

For example, any fruit larger than 2½ in. will not pack satisfactorily because of the centre division and the narrowness of the box, which is only 6 in. wide.

All sizes of citrus and pears can be easily packed in the "half-dump," which makes this case a most suitable container for the local market. As evidence of the value of the "half-dump" for fruit packaging, this box has been extensively used in this State for the export of tomatoes, pears and stone fruit, and for the large inter-State trade in Geraldton tomatoes.

During the past three seasons some of the leading fruit growers, after using the "¾-flat" for many years, have found the change to the "half-dump" has been to their benefit. Any variety and size of fruit in the "half-dump" looks attractive to the buyer, whereas only the small sized fruit can be displayed satisfactorily in the "¾-flat" case.

The "half-dump" is also much easier to pack than the double-sided flat case, which, when one end is filled, must be carefully turned to pack the other end without overbalancing the box in doing so. The same case-making bench can be used for "half-dumps" and "dumps" but the "¾-flat" requires a different bench.

Also the middle partition of the flat case is liable to be off-centre adding to the difficulty in packing the two sides to the same height to avoid damage when lidding. Again, the same nailing-down press can be used for the "dump" and "half-dump," whereas a special arm is needed for the flat case. Where the "¾-flat" case has to be dumped before nailing down, much damage can be done to the fruit, particularly as much second-class timber is generally used for the construction of these cases.

The stacking of the "half-dump" cases can be much easier when cross-stacked, as they occupy the same floor-space as the dumps, but the ¾ case, because of its

extra length, does not fit as well on the merchants limited floor space.

Some buyers, especially the packers, still prefer the ¾ cases for lemons and mandarins and small-sized Bartlett pears, but many of the large metropolitan retailers have had good results with the fruit packed in "half-dumps."

The biggest changeover to the "half-dump" case has been in the marketing of pears, particularly when the fruit is packed out of cool store. The market for freshly-packed pears has been most encouraging and has proved to be the only practical method to handle pears for the late market.

Large sized Comice pears usually sell at premium prices and the use of the "half-dump" with corrugated cardboards has been proved to be the best case to protect the fruit. The skin of Comice pears is easily damaged and every care should be taken when handling this variety.

The Maida Vale citrus growers who specialise in the marketing of summer lemons now use the "half-dump" for all lemons and mandarins.

Early apples have also been marketed with success in the "half-dump" where supplies are limited to a few cases from a grower.

Although in many instances the "¾-flat" is a useful box, the "half-dump" will be used by more and more growers in the future for packing their fruit for the local market.

A revised packing chart has been compiled for the packing of lemons and mandarins in the "half-dump" cases and will be available from the District Instructors or the Department of Agriculture. Charts are also available for plums and tomatoes in half cases.

Aberdeen-Angus in the South-East

Aberdeen-Angus cattle at the Esperance Plains Research Station. A commercial herd of Aberdeen-Angus cattle was commenced with 34 unmated heifers in May, 1957 and these were mated in June of that year to an Aberdeen-Angus bull. Research into growth rates and seasonal live weight changes is being carried out at the Station. The herd now totals 95 head.

H. Biggin and Son's Grand Champion Merino ram at the 1959 Perth Royal Show

G. & S. Threlfall's Poll Merino ram which gained the Reserve Grand Championship in the Merino class and the Championship in the Strong Wool Poll Merino class at the 1959 Perth Royal Show

Famous Sheep Breeds

1.—THE MERINO

By J. A MALLETT

THE Merino breed has often been described as "the Royal Family of the Sheep World" and this title was never more applicable than in the case of the present-day Australian Merino—a sheep which, in addition to producing the world's most valuable wool is so staunchly-constitutioned that it will thrive under a wide range of conditions and has survived droughts in which the hardy native animals perished in thousands.

There is much that is not known—and probably never will be known—concerning the origin of the Merino. Spain was the original home of the breed but although the Romans were eulogising the fine wools of Spain long before the birth of Christ, it is generally believed that the sheep which produced that wool were not Merinos but a breed which grew a long, plain-stapled wool of a reddish-brown colour.

Even the origin of the name "Merino" has long been a source of conjecture, and many different explanations have been given for its adoption. One is that the name was originally "Marina" signifying that the breed came from across the sea. Another is that it came from the Spanish term for "wandering"; or from the Latin "majorinus" signifying a head-man, or a judge or governor. To my mind, the most feasible explanation is the one now most popularly accepted—that the name came from the Beni Merin, the Moroccan tribesmen who, during the Moorish invasion of Spain in the 12th Century, moved to Spain in large numbers taking their sheep flocks and horses with them.

The term "Merino" appears but rarely in the Spanish archives prior to 1600 A.D. and does not seem to have come into general use until nearly two centuries later.

It was during the Moorish rule that Spanish sheep-husbandry reached its highest peak, for the Moors had long been famed as stock-breeders. Following upon the expulsion of the Moors in the 15th Century there appears to have been a gradual falling-off in the quality of the Spanish sheep and wool although for many years they maintained their reputation as the world's best.

For centuries, Spain's virtual monopoly of the fine wool trade was closely guarded and laws were passed making the exportation of Merino sheep an offence punishable by death. Up to the 18th Century the Merino flocks were the property of the Crown, certain religious orders, and a few

Fig. 1.—An 18th Century drawing showing a Spanish Merino ram and ewe. They would grow fleeces weighing about 6 lb. and 4 lb. respectively

Fig. 2.—This Merino ram and ewe from the Electoral Saxony flocks were exhibited in Parramatta in 1828

wealthy grandees who together formed a powerful and unscrupulous federation privileged to travel their vast "cabanas" or flocks to the mountains for summer grazing and back to winter on the plains. The "Council of the Mesta," as the sheep-owners' committee was called, practically made its own laws and there was no redress for the unfortunate villagers whose commonage and crops were eaten out by the travelling hordes.

The Merinos of those days differed greatly from the big-framed robust sheep which have made Australia famous. They were light-cutting, sparsely-woolled animals with small-framed, active bodies ideally fitted for the rigours of the almost continuous travelling. Some of the outstanding cabanas were the Escurial owned by the King of Spain, the Negretti and the Infantado named after their aristocratic owners, and the Paular which belonged to the Carthusian monks. Sheep from these ancient Spanish flocks provided foundation stock for most of today's leading Merino studs in many parts of the world.

MERINOS IN BRITON

It is often rumoured that Merino sheep were introduced into England in Elizabethan times but if so they were absorbed into the native breeds. I have often thought that both the Dorset Horn and the Ryeland could conceivably have an infusion of Merino blood far back in their ancestry. The Ryeland wool differs from that of other British breeds, while the spiral horns and the unique breeding habits of the Dorset Horn also suggest some Merino forbears. Both breeds are white-faced and neither quite fit into the Downs class.

The first recorded importations of Merinos into England were made during the reign of George III. Despite the ban on exports, it would appear that a few were smuggled out through Portugal and shipped to England late in the 18th Century.

Later, through the efforts of Sir Joseph Banks, some Negretti rams and ewes were obtained by more orthodox means and then when the Spanish insurrectionary forces became Britain's allies against Napoleon, many very large shipments were made.

A number of Merino flocks existed in England until fairly late in the 19th Century, but the cessation of the Napoleonic wars made it possible to import fine wools cheaply from abroad, and concurrently, the growing industrialisation of Great Britain switched the demands from wool to meat for which the British breeds were much better suited.

THE DISPERSAL OF THE SPANISH FLOCKS

France probably smuggled in a few Merinos quite early in the 18th Century and in 1723 a breeding flock was sent to Sweden.

In 1765 the Elector of Hanover, a cousin of the King of Spain, obtained a draft of 82 rams and 198 ewes from some of Spain's finest flocks and a similar consignment was sent to Saxony in 1778. Prussia, Austria and France also obtained breeding flocks from Spain, and Louis XVI of France established a Royal stud at Rambouillet—which has given its name to a well-known Merino strain.

Napoleon's invasion of Spain in 1809 hastened the dispersal of the Spanish flocks. Many thousands of Merinos were

driven across the Pyrenees into France by the victorious French armies and large numbers were butchered to feed the invaders.

A number of the sheep-owning Spanish grandees joined the French, and the revolutionary Government—which was badly in need of money—promptly seized their flocks and sold them to the highest bidders.

Fig. 3.—An old photograph of the Peppin's famous ram "Emperor." This ram was a Rambouillet Merino, but it will be noted that he was a plain-bodied animal, with the triple neck-fold as his sole claim to "development"—an animal not differing greatly from the present-day ideal

William Jarvis, the Americal Consul at Lisbon took full advantage of this unique opportunity and vast numbers of Merinos from the best Spanish flocks were shipped across the Atlantic.

These were not the first Merinos to reach North America, for small drafts had been smuggled out at various times through Portugal but the purchases arranged by Jarvis meant that America had what was probably the largest group of purely Spanish Merinos in the world.

Russia and South Africa were among other countries which introduced Merinos about this time and this widespread dispersal marked the end of Spain's supremacy in the wool world—a supremacy which she never showed signs of regaining.

THE MERINO IN AUSTRALIA

According to old letters, there was a a Merino ram among the 44 sheep landed in Australia from the First Fleet in 1788, but as all but one of these sheep were soon reported to have died from sickness and the attacks of dingoes, it is unlikely that Australia's first Merino survived more than a few weeks.

The first sheep flocks of the pioneer settlers were the hairy fat-tailed sheep from the Cape and the long-legged, flop-eared Indian breeds, most of which resembled goats rather than sheep.

The introduction of the Merino to Australia came about more or less by accident. In 1797 Captain Waterhouse of H.M.S. "Reliance" and Captain Kent of H.M.S. "Supply" were sent to the Cape of Good Hope to purchase livestock for the colony in New South Wales. The widow of Col. Gordon, the former commander of the Dutch garrison at Cape Town had some Spanish Merino sheep, 26 of which were purchased privately by Waterhouse and Kent for £3 a head, each taking 13 sheep.

All but one of Kent's sheep are reported to have died on the voyage to Australia but Waterhouse appears to have landed most of his consignment and distributed some among other settlers, retaining the nucleus of a small flock for himself.

Among those who obtained some of Waterhouse's importations or their pro-

Fig. 4.—Wrinkles were still fashionable in 1906 when this concertina-patterned ram was awarded the Grand Championship at Sydney. A few years later the trend swung back to the plain-bodied sheep

geny were Captain John Macarthur and the Reverend Samuel Marsden, both of whom played prominent roles in establishing the Merino in Australia.

Macarthur had already tried to improve the wool of the Cape and Indian sheep by mating them to a rough-woolled Irish ram and he made the most of the opportunity of further improvement with the Merinos. At a sale of Merinos from the Royal flock of King George III held at Kew in 1804, Macarthur purchased seven rams and a ewe. Two rams failed to survive the voyage to Australia but the remainder were landed safely in June, 1805.

Marsden received five rams as a gift from King George III in 1808, and although the current demand in the new colony was mainly for sheep to provide meat, a small group of breeders were farsighted enough to concentrate upon fine wool production.

They encountered many difficulties, for Australia had very few Merinos to grade up to original flocks, but their tenacity commenced to pay dividends quite early in the 19th Century when "Botany wool" achieved a reputation on the English sale floors.

With settlement spreading westward following the discovery of a pass over the Blue Mountains in 1813, Australia's sheep flocks increased rapidly and heavy importations of Merinos from famous German studs took place throughout the 19th Century.

French Rambouillets and descendants of the Spanish flocks transferred to England were also used in building up the quality of Australian fleeces, but until about the middle of the 19th Century the Australian Merino was essentially a fine-woolled sheep yielding a light-weight fleece.

Attempts to increase the size of the sheep and to grow a more robust type of "bale-filling" wool were made from about 1840 onward, mainly by experimental crossbreeding with British long-wools such as the Leicester and Lincoln.

THE PEPPIN ERA

Undoubtedly, the most successful move toward producing a large-framed, strongly-constitutioned animal that yielded a heavy fleece of long-stapled medium wool, was that made by G. H. W. Peppin and his sons. George and Frederick, who arrived in Victoria from England in 1850.

In 1858, the Peppins purchased portion of the Wanganella property in New South Wales, which they operated as a fattening proposition until 1861 when a stud flock was formed using 200 ewes of their own breeding and 100 from Canally near Balranald. Rambouillet and German rams were used, and the outstanding Rambouillet ram "Emperor" had a great influence on the stud in its early years. In

1866 they purchased two American Vermont rams, one of which was the famous "Grimes" destined to play an important role in the development of the Peppin Merinos.

properties have now passed into the possession of F. S. Falkiner & Co.

Concurrently with the development of the medium-woolled type in New South Wales, breeders in South Australia were

Fig. 5.—Stud Merino ewes at the height of the "Vermont boom"

The Peppins conducted many experiments in breeding and it is usually acknowledged that an infusion of longwool blood helped to bring about the marked differences between the Peppin sheep and those of most of the contemporary flocks.

Boonoke, which the Peppins had acquired some time after their purchase of Wanganella was conducted on similar lines to the original property.

Later at Wanganella, the Peppins formed a "double stud" using 365 ewes and seven rams which they selected as the pick of their stud flock. This "double stud" and the ordinary stud were run as separate flocks.

In 1878 Wanganella, plus the "double stud" and half the ordinary stud were sold to Messrs, Austin and Millear. Boonoke and the other half of the stud were sold to F. S. Falkiner & Co. in the same year. In 1894 the Austin-Millear partnership was dissolved, Austin retaining Wanganella and portion of the flock, while Millear founded Wanganella Estate with his share of the stud. All three

working on similar lines in the evolution of the strong-woolled strain which has many adherents in our own State.

THE VERMONT INVASION

During the last quarter of the 19th Century, despite the influence of the heavy-cutting Peppin sheep, the average cut per head of the Australian sheep was low (just over 5 lb. in 1883).

Samuel McCaughey (he was knighted later) was the "sheep king" of that era owning vast properties and depasturing about a million and a quarter sheep in New South Wales and Queensland.

He bought rams from Boonoke and Wanganella in an attempt to raise the fleece weights, but after seeing the success achieved in a neighbouring flock by using an imported American ram, he purchased ten rams from the U.S.A. which formed portion of a consignment offered for sale in Sydney in 1883.

These rams were descended from French Merinos—and it will be recalled that much

Fig. 6.—A typical modern stud Merino ram

of the success of the Peppins was due to the introduction of the French Rambouillet ram, "Emperor" and the American Vermont ram "Grimes."

It would appear that these early American importations were good sheep, even judged by modern standards—big, plain-bodied animals carrying dense fleeces of stylish wool. They yielded heavy fleeces of greasy wool and although their wool carried far more "condition" than is favoured today, reports indicate that they were successful in increasing the yield per head even on a scoured basis.

Their progeny were highly successful in the main sheep shows, wresting the laurels from Wanganella which had up till then, taken most of the major awards.

Fired with enthusiasm, inspired by the success of the American rams, McCaughey made a special trip to the U.S.A., where he spent over £50,000 on Vermont rams which he shipped to Australia in vast numbers.

Some were good—many were not. Some were plain-bodied—others were a mass of wrinkles. They yielded fleeces weighing, in some instances at least, over 50 lb. "in the grease," but in many cases there was far more grease than wool and the scoured weights were often lower than those from plain-bodied Australian sheep.

The importation of these concertina-patterned Vermonts by McCaughey triggered off "the cult of the wrinkle" in Australian flocks.

"The more wrinkles, the greater the skin area; the greater the skin area, the more wool," was the slogan. Judges refused to look with any degree of favour on plain-bodied sheep, and a glance at the photographs of the Grand Champions from 1890 onward shows how the craze for wrinkles affected even the topline judges.

By the beginning of the present century, more and more breeders were beginning to realise that the "Vermont invasion" had been a tragedy for many studs—that Australia had gained little if anything from the importations and had lost far more than she could afford in wool quality and lowered constitution.

Drought years demonstrated that flocks carrying a preponderance of Vermont blood fared badly, and although wrinkly sheep continued to find favour with some show judges until about 1910, there was an ever-increasing preference for plain-bodied sheep whose sole concession to "development" was in the handsome triple neck-fold—the type of sheep which takes the honours in the shows of today.

POLL MERINOS

When it is realised that few of our modern breeds of livestock have been pure-bred for more than half a century—that little was known about the science of genetics by most of our leading stud-breeders until the present century was

well advanced—it is not surprising that "sports" have appeared from time to time in all breeds which differed widely from the popular conception of the ideal animal.

Most breeds originated from a blend of two or more strains, often from a hotch-potch of assorted ancestors, and were developed along certain lines by the skill of the early breeders, assisted to some degree by environmental conditions.

Rigorous culling was practised in the early years to bring the breed nearer to the breeder's ideals but even today, occasional "throw-backs," "sports" or mutants appear in flocks and herds of irreproachable lineage.

Usually such "off-type" offspring are culled or destroyed. Occasionally, as in the case of the appearance of hornless animals in horned flocks and herds, attempts have been made to evolve polled strains.

Several of Australia's leading Merino stud-breeders have worked on these lines for about 25 years and the Poll Merino Breeders' Association was formed in 1956 and now has over 200 breeders on its register. The polled characteristic is a dominant factor and the Poll Merino strain is rapidly gaining in popularity.

"Poley" enthusiasts claim that the horns are a disadvantage, in that horned rams are liable to be caught up in fences; are more susceptible to head strike by blowflies, following injuries sustained in fighting, and that the growing and carrying of a heavy pair of horns takes nourishment that could otherwise be utilised in wool and meat production.

WHY BUTTERFAT TESTS VARY

It is often asked why it is that milk tests for fat vary from time to time with individual cows or with bulk samples from the same cows in herds.

The age of the cows, seasons of the year, stage of lactation and temperatures are just a few of the reasons why these variations occur.

The Babcock test was developed in 1890 and ever since then the content of butterfat in milk and cream has been used in the buying and selling of these products, and as the basis for calculating production records of cows and herds.

No matter how accurate the methods used, the fat tests will vary and slight fluctuations on the day of testing can make large differences when multiplied by the total milk production for the month.

As a general rule the average tests of the Channel Island breeds are much higher than the Australian Illawarra Shorthorns and Friesians. Jersey milk would average as a general rule over 5 per cent. fat; Guernseys over 4.5 per cent.; Australian Illawarra Shorthorns and Friesians 3.5 to 4 per cent.

Inheritance within the breed plays a part in the fat variations as some herds are selected for milk production and others for butter fat. Again some cow families test much higher than others and with the lower testing breeds this could be a very valuable attribute.

The fat content tends to decrease slightly as the cow ages and this difference can be as much as 1 per cent. between a cow's highest and lowest average testing lactation.

Probably one of the causes which has a big influence on butter fat tests is air temperature, as low temperatures tend to increase the fat content while high temperatures tend to decrease its percentage in milk. This could affect the breeds or individual animals with high fat content milk more than the ones with low tests. Probably the biggest upset occurs when sudden changes of temperature take place. Taking this into consideration the big climatic variations in the seasons of the year will have an influence on the butterfat percentage of milk.

Other factors apart from those given, which can have an influence on the fat content of milk are feed, interval between milkings, stage of lactation, methods of milking, condition of animal and management.

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Banana Packing and Waxing

By J. A. LAWSON, B.Sc. (Agric.), Adviser,
North-West Branch

IN 1955, representatives of the Carnarvon banana growers approached the North-West Branch of the Department of Agriculture with the suggestion that tests be made concerning the value of waxing bananas prior to consignment. It was claimed at the time by the Director of Horticulture of the Queensland Department that, by means of wax dipping, bananas had been transported from Northern Queensland to Brisbane, ripened artificially, and then returned to Northern Queensland for sale in the middle of summer, whereas the undipped fruit arrived completely unsaleable.

As a result of the inquiries made, some samples of wax were obtained from the oil company which is handling the product at the present time. These consist of a finely divided crystalline wax emulsion and a blended paraffin wax emulsion. One part of the former is mixed with three parts of the latter, three times the total volume of water is added, and a small quantity of the detergent, Penetrax, is mixed in to make the emulsions spread over the surface of the fruit.

INVESTIGATIONS COMMENCED

In 1956, a series of fruit quality investigations were commenced from the Gascoyne Research Station, and periodically one or more of the test cases were treated

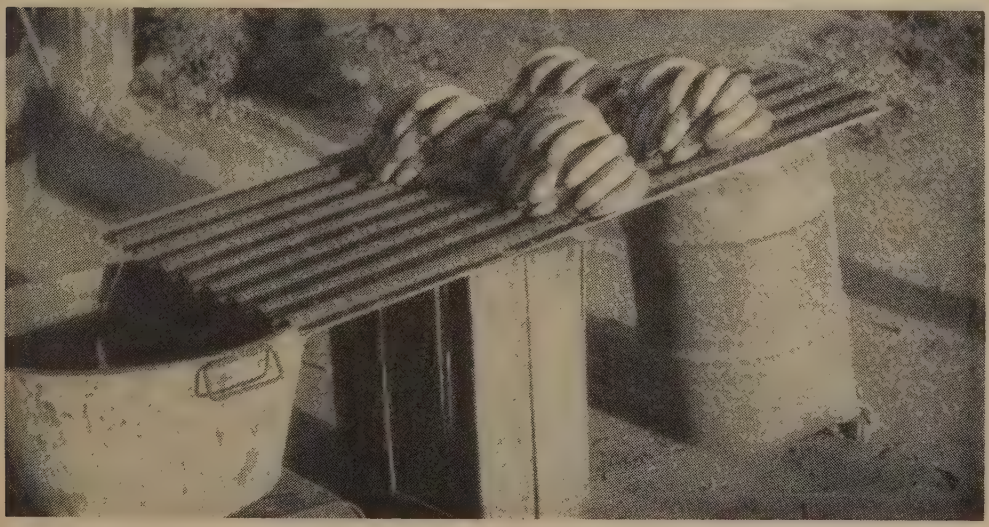


Fig. 1.—A primitive but effective method of waxing bananas. A sheet of corrugated iron serves as a draining board and a bowl holds the waxing solution

with wax before consignment to the Metropolitan Markets. Samples from the test cases were held over in Perth after ripening until complete breakdown had occurred, and this was carried out over a period of 18 months. From repeated tests over two seasons, it appeared that fruit which had been waxed was keeping longer in either summer or winter than any other fruit in the consignments.

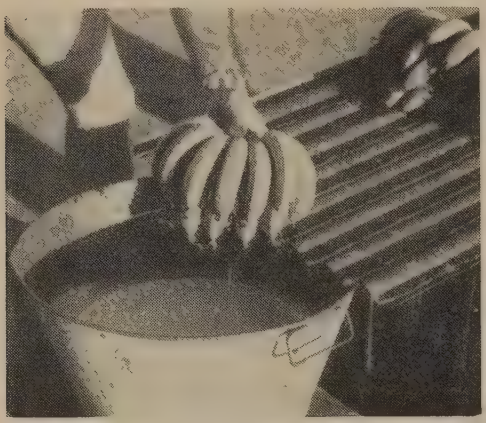


Fig. 2.—Dipping a hand of bananas in the waxing solution

In the summer of 1958-59 a somewhat larger consignment of waxed fruit was sent to Perth from the Gascoyne Research Station, this time with the object of investigating the reaction of shopkeepers to such fruit. The indications from this original consignment were encouraging. Several growers who had expressed interest in the project were enlisted in the next phase of the trial, and 15 cases of fruit altogether were treated. During the sale in Perth, buyers were asked to watch the fruit over a period of time and offer criticism and comment on its appearance and keeping quality after being held in the shop for a number of days. The reaction of these buyers was such that most of them asked for more waxed fruit, and were prepared to pay up to 1d. per pound more for it. More growers have since made inquiries, and have obtained wax and are treating a percentage, if not all, of their fruit.

POINTS WORTH NOTING

The advantages in waxing are threefold. The fruit definitely keeps longer, both in summer and winter, without loss of flavour. Bruising after waxing has been carried out is minimised, and small rub marks and scratches do not seem to develop to the same extent as in the untreated fruit. The appearance of the fruit is definitely enhanced; it seems to have a more even and deeper colour, and has an attractive shine.

It now appears that those agents who repack bananas for country orders, are buying increased quantities of waxed fruit for their trade, since it carries so much better over distance. This is of considerable importance, since most of these buyers had previously purchased New South Wales fruit.

A SIMPLE PROCESS

The waxing process itself is very simple. After the wax has been mixed and bulked with water as described earlier, it is placed in a receptacle large enough to take a complete hand of bananas. As dehanding is carried out, each hand is completely immersed in the wax before being placed in the stack on the bench. Some growers have arranged simple draining boards, upon which they place each hand after immersion, so that surplus wax will run back into the receptacle. Using this method, stacking is carried out after each bunch has been completely dehanded, commencing stacking with the first dipped hand. Drying does not usually take long once the stacking has been carried out and packing can be commenced at any time after the fruit has been dipped.

There are several disadvantages to the process. The time taken for dehanding and stacking is at least doubled by the increase in handling entailed in waxing. Once dipped and stacked, hands of bananas have a strong tendency to slip about, and on occasions large quantities have fallen from the bench to the floor. This means that extra care is required in stacking, and that stacks cannot be made very high.

It is hoped that at least 20-30 per cent. of the bananas now leaving Carnarvon will be waxed in the near future, so that those buyers who now show distinct preference for it can be assured of further supplies, particularly in the case of repacking agents.

Once wax has been mixed and used it commences to slowly break down, but it has been found that it can be used again at least once, provided that the intervening time is not longer than two weeks. After this time there is a tendency for the suspension to form coagulating lumps.

The process is quite inexpensive. One gallon of wax costing approximately 14s. at Carnarvon, is sufficient to treat about 30 cases of fruit, and if a draining board is used this number of cases is increased further.

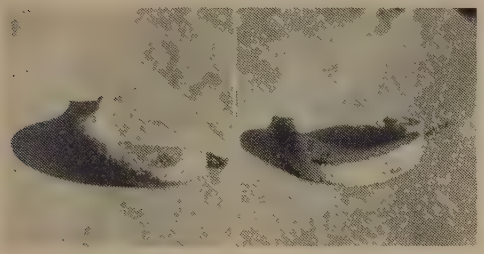


Fig. 3.—Bananas carrying bruises or blemishes like these should not be waxed

GOOD PACKING PAYS

One point should be made clear at this stage. The waxing of poor quality or badly packed fruit will gain nothing for the grower concerned. In fact, more could be gained for the district as a whole at the present time, by improving the culling, grading and packing of our fruit. It has recently become noticed that the presentation of fruit by the average Carnarvon grower leaves much to be desired. This is perhaps the main reason why so many buyers have elected to purchase bananas imported from New South Wales. This imported fruit is, as a general rule, neatly and well packed, the cases are all well papered to minimise bruising, and it is obvious that not so much "bulge" is used, the overall effect being that nearly 100 per cent. of the fruit is fit for sale.

It is easily within the means of Carnarvon growers to bring their pack to equal or even better standard. The principal points to be observed when packing are:—

(1) Paper the case on sides, top and bottom to minimise bruising against the rough boards.

(2) Be sure that each individual fruit sits into a groove of the previous layer; fruit should never sit one on top of the other, as cracking and bruising will result.

(3) Do not thrust the fruit down into the sides of the case; you will not only bruise either the nose or the shoulder, (depending on whether you are using the reverse or orthodox pack)—you will also create "side bulge." If this occurs, your poorly-packed case could easily damage someone else's fruit during the journey to Perth.

(4) Do not build layers of fruit too high above the top of the box. The maximum is $1\frac{3}{4}$ bananas high for small fruit and $1\frac{1}{2}$ for large. If you are packing higher than this there is a very good chance that some will be split or badly bruised.

(5) Don't lid down immediately after packing, because the fruit will still be hard and brittle, so that it cracks more easily.

(6) Try to keep the bananas matched in the case according to their position on the hand. A banana from the bottom of the hand, which is moderately bent, when placed alongside an almost straight fruit from the top of the hand neither looks well nor fits well.

(7) Be very careful when packing centre layers. Make sure that the bananas fit firmly and will not be bruised by the outer layers.

(8) Throw away any badly marked or bruised fruit. It could easily reduce the price of the whole case.

(9) Do not pack bananas from a ripening bunch among those from less mature bunches, since uneven ripening will spoil the appearance of the whole case.

(10) Avoid under-grading and also make sure that all the fruit in each grade is of even size.

(11) Do not let your fruit fill to bursting point, particularly in hot weather, since it will sometimes break down prematurely.

(12) Never step on your cases, and be sure that the carrier is equally as

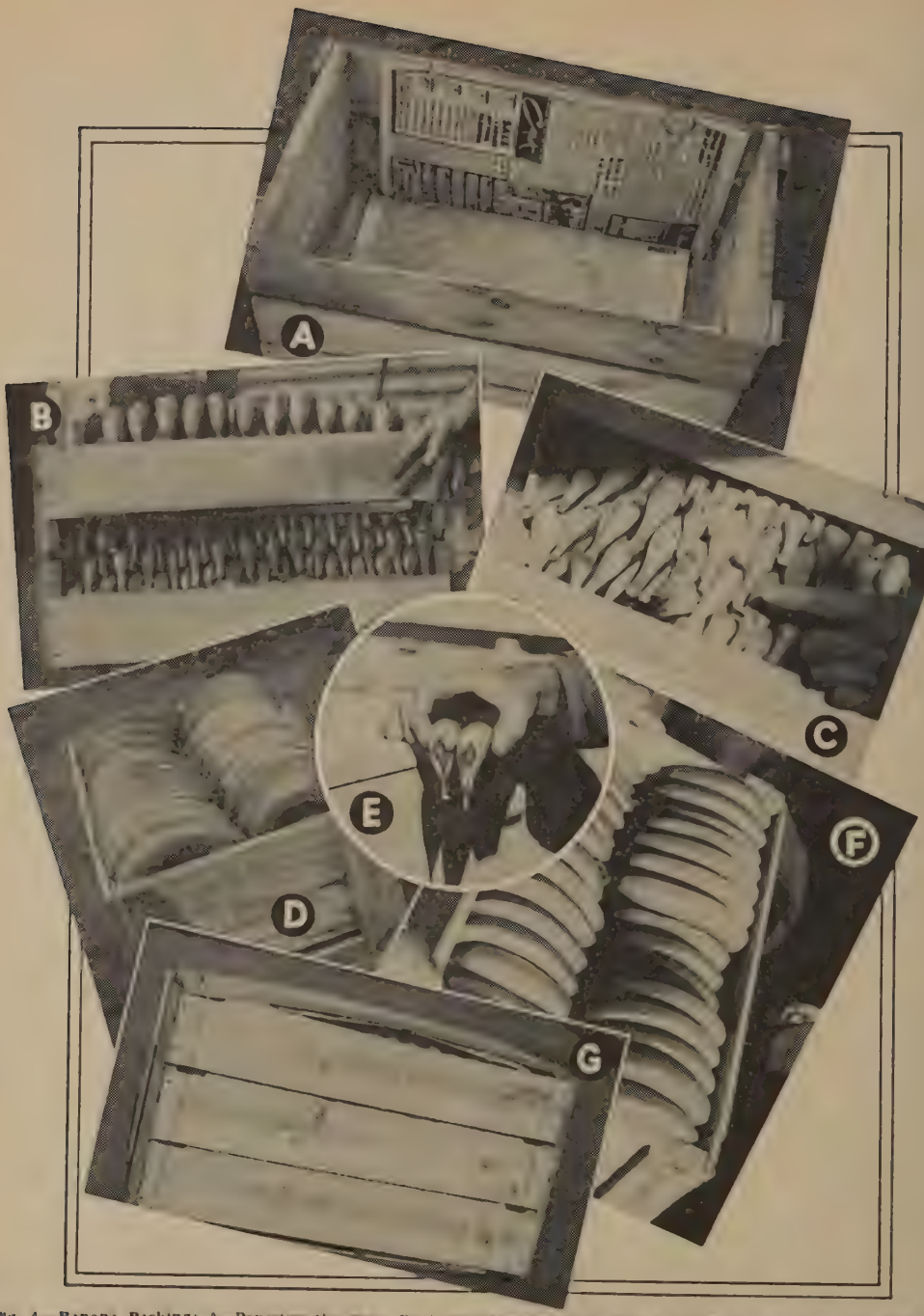


Fig. 4—Banana Packing: A—Papering the case. B—A neatly-packed case with a board removed from the side to show the details of the pack. C—Careless packing shown here seen lowers the standard of the district's produce. D—Evenly-sized fruit is an aid to good packing. Note height of fruit to give an adequate bulge to the lid. E—Bruises on fruit which has been rammed down the side of an unpapered case. F—A good pack nearing completion. The fruit is evenly-sized with layers fitting into the grooves of the preceding layer. G—A well-packed case showing the desirable degree of bulge on the lid

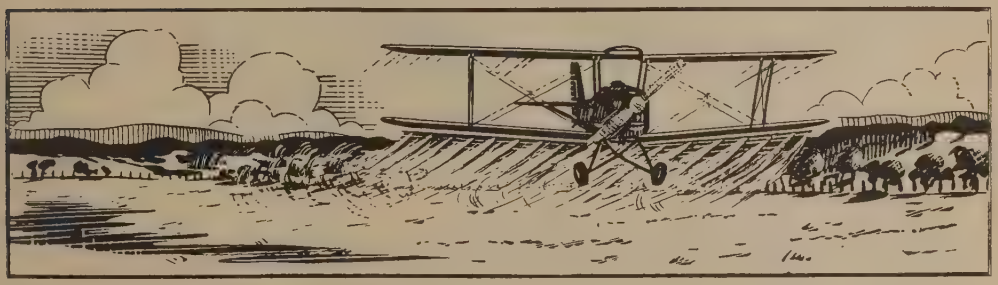
careful, since the weight of a man on the pliable boards of a banana case will bruise a large quantity of fruit.

(13) Never leave fruit in the sun either before or after packing, or premature break down will be the result.

(14) Handle bunches carefully when cutting and "carrying out," to avoid bruising and splitting.

Any grower has the capacity to pack well once properly instructed. Care and patience are most necessary right from the outset; speed will come later. It takes 18 months to produce each bunch of bananas, so a little extra time in the packing shed to perfect the presentation of the product will do no harm.

If the packing standard of our district as a whole can be lifted, better prices can be maintained.



CEREAL HARVEST PROSPECTS

After consideration of reports received from the cereal growing districts it has been decided that no alteration will be made to the preliminary harvest forecast which was issued by the West Australian office of the Commonwealth Bureau of Census and Statistics on October 26.

When the first forecast was issued the possible effect of the then recent rains was taken into consideration and the latest advice received has confirmed that forecast which was for a total production of some 48.5 million bushels of wheat from 3.65 million acres for an average yield of 13.3 bushels per acre.

The marketable harvest is estimated at approximately 44.5 million bushels.

Information received from the various district offices indicates that the late October rains were very beneficial and in general the crops have matured satisfactorily and disease incidence is generally very slight.

No alterations have been made to the estimated production of oats for grain which remains at 17 million bushels from 1.25 million acres for 13.6 bushels per acre. Some 400,000 acres of barley are expected to be harvested to yield about 5.5 million bushels for an average of 13.8 bushels per acre.

Cereal hay crops (wheat and oats) are expected to yield about 260,000 tons, averaging one ton to the acre.

This latest forecast was again prepared by the West Australian office of the Commonwealth Bureau of Census and Statistics in collaboration with officers from the Department of Agriculture and with the assistance of estimates and seasonal reports from the several branches of the Rural and Industries Bank.

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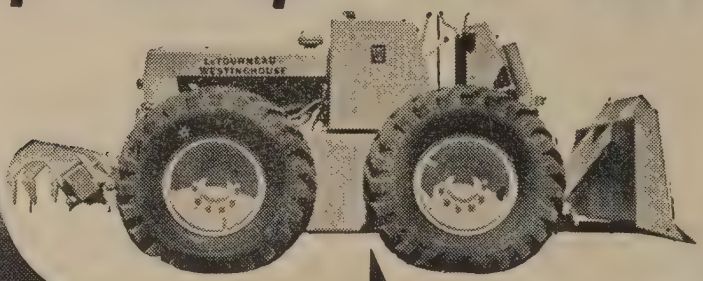

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LUPINOSIS

by

H. W. BENNETTS, D.V.Sc., Principal, Animal Health and Nutrition Laboratories

LUPINOSIS is a disease which has caused severe mortalities in West Australian sheep flocks in recent years, and one which—because of the important role which lupins are playing in light land development—must inevitably continue to be a matter of serious concern.

At the outset, it is essential to clear up a popular misunderstanding and to emphasise that lupinosis is NOT lupin poisoning.

It is well known that many varieties of lupins—including the West Australian blue lupin (*Lupinus digitatus*) and the New Zealand blue lupin (*Lupinus angustifolius*)—contain poisonous alkaloids, an excessive intake of which can cause convulsions, madness and other nervous symptoms which often result in death.

Lupin poisoning is an acute condition and the effects are not cumulative. Heavy mortalities may occur when hungry sheep eat large quantities of lupin seeds in a short period of time, but under local conditions of sheep husbandry such mortalities are rare. Not uncommonly, transient intoxication and convulsions may occur when sheep are driven following heavy intakes of lupins, but complete recovery usually takes place if the sheep are rested.

Lupin alkaloids are rapidly eliminated in the urine, but troubles can arise when the absorption of the alkaloids takes place more quickly than they can be eliminated from the body.

Lupinosis on the other hand is a condition which appears to be quite unrelated to the poisoning by alkaloids*. It is cumulative in its effect and is characterised by liver damage manifested by dullness, loss of appetite and "yellows" or jaundice. Death may occur within a few days or be delayed for as long as two months, even following a change of diet. In the more chronic cases, wasting is a feature. Many affected animals recover, because of the remarkable regenerative capacity of the liver, but they naturally show a temporary loss in bodily condition. The death rate may be as high as 30 per cent. of the flock. Indirect losses are by no means negligible. The erratic and unpredictable incidence of lupinosis, moreover, makes this problem a very worrying one. Until more is known about the actual cause and mechanism of the disease the development of light lands with the aid of lupins cannot be undertaken with confidence.

*(1) Lupin alkaloids are constantly present, particularly in the seed, yet the occurrence of lupinosis is most erratic and unpredictable.
(2) The alkaloid content of husks from a sample of W.A. blue lupin, which induced lupinosis when fed to experimental sheep, was found to be very low.
(3) Pure alkaloids, prepared from the same species, have been fed to laboratory animals for prolonged periods without inducing liver damage.
(4) We have fed laboratory sheep for prolonged periods (to 8 months) on the lupin seed alone; no liver damage resulted although signs of alkaloid poisoning were noted from time to time.

A PROBLEM DISEASE

The first task in formulating methods of controlling or preventing a disease is to learn all that is to be known concerning the disease itself—its history in other countries, what causes it, the circumstances or environments that favour its occurrence, the varieties of plants most likely to cause the disease, etc., etc.

Here we have encountered many puzzling features. Apparently, the disease was first described in Germany in the latter part of the 19th century when it became a serious problem, but the most extraordinary feature is that in Europe, as in Western Australia, the disease was recognised and became a menace only after lupins had been used widely and with safety as a stock food for more than 20 years.

The reason for this is not yet understood. It seems evident that lupinosis results from some harmful factor which is not constantly present in the plants in dangerous concentrations.

What this factor is, has yet to be determined.

Fig. 1.—Portion of a "fatal" paddock of New Zealand blue lupins at Mooliabeenie, 1959. There were only 25 acres of lupins in a 900 acre paddock with a good balance of other feed, yet 70 out of 500 sheep died as a result of only one week's continuous grazing

It is something which is not confined to any one of the many lupin varieties as several different species have been implicated.

Its presence cannot be related to any known changes in environment as the incidence of lupinosis varies from year to year and from location to location, apparently without rhyme or reason. The German research workers demonstrated that lupins from the same field could be harmless in some years and highly dangerous in others, yet they could not relate these findings to any set of circumstances.

Experience has shown that the increase in lupinosis cannot be ascribed to changes in farm management and practices. Sheep commonly grazed lupin-dominant paddocks with impunity for many years prior to 1951 when the disease first commenced to be a problem here. Conversely, some very serious mortalities have been recorded, in recent years, on paddocks where lupins comprised only a small proportion of the effective grazing.

In some years, notably 1959, losses may be widespread and severe, yet in other years very few deaths are recorded. On some properties in some years, lupins may be grazed with perfect safety. Sometimes only individual paddocks are dangerous. Occasionally, as in the present season, all lupin paddocks on a property may appear to be implicated.

Climatic influences; soil types; fertiliser treatments; the age of lupin establishment; *mould growths or disease affecting lupin plants; changes in farm practice notably those favouring lupin dominance in the diet of the animals, are among factors studied without yielding any definite clues to the predisposing causes of lupinosis.

We know that a diet dominated by "dangerous" lupins is more likely to cause lupinosis than a well-balanced diet, and that repeated feeding on such plants will probably lead to cumulative liver damage.

It seems too, that it is the consumption of lupin roughage which causes lupinosis, and not the seeds, as was believed earlier.

* In view of recent evidence that moulds growing on pasture plants may cause liver damage, this aspect is receiving further study.

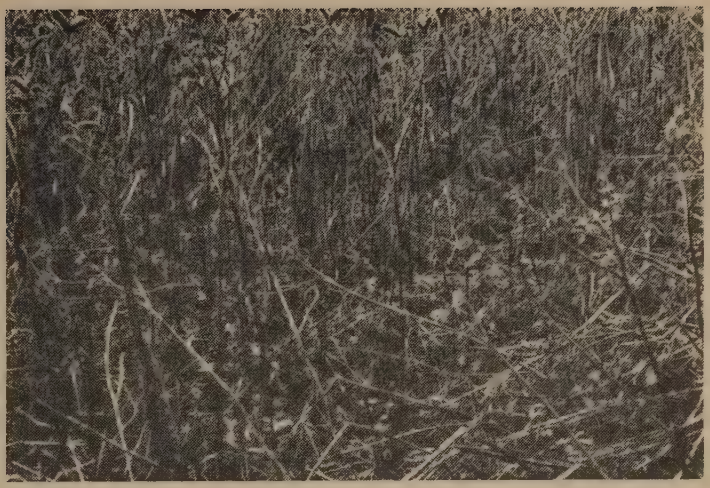

Fig. 2.—Portion of four acres of West Australian blue lupins fenced for experimental purposes at Dandaragan. Seventeen out of 20 sheep grazed on this area showed evidence of lupinosis.

German research workers showed that the active principle was concentrated in the husks, and they induced lupinosis in experimental sheep by feeding them on husks or by giving them a watery extract derived from the husks.

In Western Australia we have reproduced the disease in laboratory sheep by feeding lupin roughage collected from three properties where heavy losses were experienced in 1959, and we have a stockpile of this material which is being used for experimental and chemical studies to determine the cause and nature of lupinosis.

GREEN LUPINS AS A CAUSE OF LUPINOSIS

Until recently we thought that green plants could be grazed with impunity. In 1958, however, lupinosis was diagnosed in more than one flock, which, presumably because of unusual seasonal conditions, preferentially grazed lupin plants about 18 in. high during the July period. On one property sucker lambs were affected. affected. Cattle have been affected as a result of eating lupin hay cut green, and recently lupinosis was diagnosed in a mob of cattle which had grazed intensively on young green plants for two weeks, due to shortage of other herbage in their paddock. It appears therefore that the green plant, lupin hay, and by inference, lupin silage, cannot be regarded as a completely safe ration.

MANIFESTATIONS OF LUPINOSIS

The condition, lupinosis, is essentially the manifestation of more or less severe liver damage which may result from a lupin diet. In acute cases the liver is heavily infiltrated with fat, being enlarged, bright yellow and very friable. In more chronic or protracted cases there is liver destruction followed by scarring and fibrosis. The liver may be paler than normal, very firm in texture, and may be very small and abnormal in shape ("boxing-glove" liver). Some degree of liver damage may be tolerated, and abnormal livers (of the chronic type) are commonly detected in sheep killed for rations. When the condition is severe or acute, animals may die after only a few days illness and after only one or two week's grazing on "affected" lupins. At the other extreme there may be little definite indications of sickness other than a slight or progressive loss of condition over a protracted period. Deaths may still occur for two months or so after a complete change of diet, although removal from lupin paddocks in many instances results in complete recovery. Sheep with marked liver damage may succumb to stress—in several instances drenching with phenothiazine, for example, has apparently precipitated mortalities in affected flocks.

Common signs of lupinosis are dullness, isolation and loss of appetite—jaundice or "yellows" is frequently evident. Affected

sheep often die with their heads pressed against obstructions, fences, trees etc. In some instances sheep and cattle have shown evidence of photosensitisation, a sunburn of ears, muzzles and other parts of the body unprotected by pigment, wool or hair. This results from a sensitisation of the skin with derivatives of chlorophyll (the green pigment of plants) which cannot be disposed of by the damaged, abnormal liver.

Lupinosis may affect horses as well as sheep and cattle and may be induced in some other species experimentally. Here we have encountered only one case in a horse and few cases in cattle. In sheep, lambs and weaners appear to be particularly susceptible. There is some evidence which suggests that crossbreds are more susceptible than Merinos. It seems that repeated experiences of lupin grazing do not necessarily increase susceptibility, although sheep which are familiar with lupins are more apt to graze them heavily and selectively when first turned into lupin paddocks and liver damage may be cumulative from season to season.

LUPINS AND LUPINOSIS IN GERMANY

A comprehensive account of the use of lupins and of the occurrence and investigations of lupinosis was given by Roloff (1883) and by other workers about the same period. No significant information can be found in scientific literature subsequently. These early investigations, however, are very pertinent to the present situation in Western Australia.

In North Germany, lupins were grown extensively, the white, blue and yellow varieties being used for stock feed. The crop was cut after flowering, when half-ripe, or ripe, and stacked as hay. The lupin hay was fed to stock, particularly sheep, maintained in barns, and meadows hay, maize, potatoes, etc., were also fed.

Lupinosis began to be a problem about 1875 and heavy and widespread losses were experienced in the subsequent years. It was observed that hay from certain fields was highly dangerous, whereas similar hay from other fields could be fed with complete safety for prolonged periods in some seasons; in other years the position might be reversed.

The severity and occurrence of the disease and the location of "dangerous" lupins varied considerably from year to year. The variations in toxicity could not be related to any environmental or other factors, except that it seemed that when the crop grew luxuriantly it was more likely to be dangerous.

It was at one time suggested that moulds growing in the hay were responsible for toxicity but this could not be substantiated. Ripe lupins were more dangerous than plants cut at an earlier stage of growth. It was deduced that the husks and seeds were the most dangerous portions of the plant. This was confirmed by an extensive series of feeding trials with sheep. Lupinosis was readily produced in the experimental animals which received husks or watery (alkaline) extracts of husks from lupin hay **which had caused lupinosis when fed on the farms.** Experiments with "sound" hay had been completely negative whereas the equivalent of as little as ½ lb to 1 lb of husks from "affected" hay readily induced lupinosis, frequently apparent within a few days of administration. Toxic extracts were further purified and concentrated but the principle responsible for producing lupinosis does not appear to have been isolated and identified up to the present time.

The German observations on the farm indicated that, although the disease was not so severe when other feeds were given in conjunction with the "affected" lupin hay, neither supplementary fodder nor grazing prevented losses.

Recent information obtained from Europe indicates that lupinosis has ceased to become a problem since the use of sweet varieties of lupins became general. It is difficult, however, to accept this as a valid answer.

LUPINS AND LUPINOSIS IN WESTERN AUSTRALIA

For more than 30 years the Western Australian blue lupin (*Lupinus digitatus*) has been grown extensively as a forage plant for sheep in the sub-coastal region north of Perth. This naturalised lupin grows to perfection on the "red gum" deep sands at Gingin and Dandaragan, and also in the Geraldton district. During the past decade it has been used widely for

the development of "light lands," in this region and elsewhere where it can be grown successfully with the aid of phosphate, copper and zinc fertilisers. The plant, on present knowledge, appears to be an essential feature in the development of these poor sandy soils for stock raising.

The New Zealand blue lupin (*L. angustifolius*) can be grown over a much wider range of soil and climatic conditions. During recent years this species, also, has been cultivated fairly widely for forage, notably in the southern districts.

Both species have proved valuable as sheep feed and for the improvement of country with a low initial fertility. Once established, the lupins reseed annually and a good "stand" is assured almost every

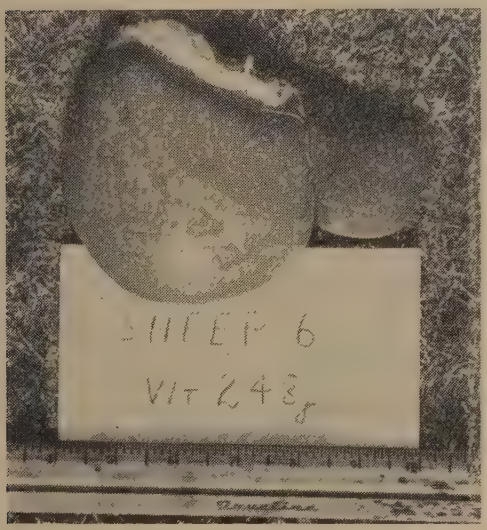

Fig. 3.—The liver of one of the experimental sheep grazed at Dandaragan. The liver is fatty, with symptoms of fibrosis

year in suitable situations and with the help of fertilisers where these are necessary. On the "light lands," particularly, several years of lupin growing and stocking favour pasture establishment.

Animal Husbandry.

For many years the principal use of the Western Ausralian blue lupin was for fattening sheep. Sheep were grazed on the lupin paddocks after the plants had seeded in November-December. In general sheep were marketed after a few weeks' grazing at the rate of four to five sheep per acre. Under these circumstances the dry roughage, leaves, husks and fine stalks were preferentially consumed in the early stages. Later the sheep fed mainly on the ripe seed picked up from the sandy soil. A "balance" was provided by edible scrub, volunteer annuals (capeweed and grasses) or by cereal crops grown for the purpose. More recently for economic and other reasons the trend has been to **maintain** flocks on lupin land at a lower rate of stocking.

The green plant is seldom eaten except in the young stage of growth and it is customary to thin out the lupin plants to the required density (to prevent suppression of the under-cover), by controlled grazing after the germinating winter rains. This under-cover may provide valuable grazing for sheep and cattle during the winter and spring months. The amount of non-lupin grazing available depends also on the initial fertility of the soil and on the period over which lupins have been grown.

Under the conditions of management indicated sheep are only rarely affected fatally by poisoning with lupin alkaloids, which are constantly present in both species.

Since 1950, however, lupinosis has become an increasingly serious problem throughout the region where lupins are grazed. Both species are implicated. The death rate from lupinosis may be high and the indirect losses may be considerable, because of problems of management and loss of condition in animals affected to a milder degree. In the early part of 1959 for example, on one property 70 of 500 sheep died as a result of only one week's continuous grazing on *L. angustifolius;* grazing *L. digitatus* resulted in the death of 200 of 700 sheep on another property, and on a third location in a flock of 6,000 sheep some 500 died and 1,000 were sold because of loss of condition and other signs of being affected.

CONTROL

On present knowledge, there are no control measures which can be recommended with complete confidence. It is rational to advise providing alternative fodder in order

to lower the intake of lupins. The destruction of lupin roughage by burning the paddocks has apparently been beneficial in some instances.

ACKNOWLEDGMENTS

In carrying out investigations into lupinosis, we wish to gratefully acknowledge the assistance received from M. C. Nottle, Biochemist, A.H.N.L., Veterinary Officer A. M. Williams (Geraldton), Agricultural Advisers, G. H. Neil and B. F. Carlin (Moora), and Pasture Improvement Groups and farmers in the Dandaragan and Gingin areas, notably Messrs. G. M. Roberts and F. A. Wedge.

REFERENCE

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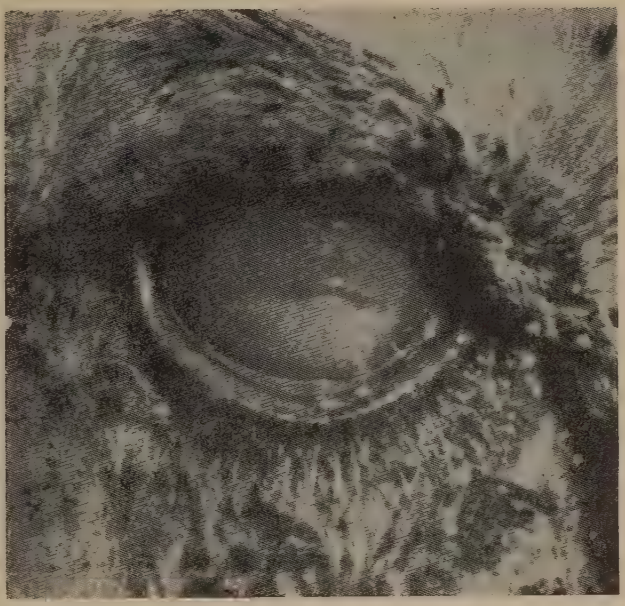
Is it worth while to treat this common summer ailment ?

Pinkeye in Sheep

Some Timely Comments

by
F. C. WILKINSON,
Veterinary Surgeon



The eye of a sheep badly affected with pinkeye. The cornea is opaque and ulcerated and the animal is blind

DURING the summer months, it is almost inevitable that numbers of sheep in Western Australia will suffer from contagious ophthalmia—or pinkeye, to give the disease its more popular name. As it can be quite a distressing disease which can cause severe setbacks, most flock owners, knowing that medicaments are available for the treatment of pinkeye, will feel that they should do something for the affected animals.

Before dropping everything and dashing off to invest in one of the several medicaments, however, it might be advisable to study the following questions.

What happens if the disease is allowed to run its normal course without interference?

What medicaments are available for treatment and how effective are they?

What will be the cost of treatment in time and money and can treatment be carried out efficiently?

The first question is very pertinent as it has been found that in the majority of cases only a mild form of the disease is seen. In these cases inflammation of the eye and a watery discharge is followed by some cloudiness of the cornea (clear front portion of the eye). Usually within 10 to 14 days of the onset of symptoms the eyes are normal again. In a small percentage of cases the disease is more severe and it may persist for as long as six weeks, with the affected sheep blind for a month or more. The eye of the sheep however has remarkable powers of recovery and even when the cornea has become cloudy and deeply ulcerated, healing will occur leaving little or no blemish.

The second question is partly answered already because in all diseases in which the animal has normal powers of recovery, there are naturally innumerable successful "treatment" agents. For pinkeye these vary from the more expensive chloreomycetin 10 per cent. eye ointment to zinc sulphate 10 per cent. eye drops in

which the cost of the medicament is negligible. Some of the treatments aim primarily at killing the germs causing the disease while others assist healing after the germ has been overcome naturally by the sheep. No matter which medicament is used for treatment, for full effect it must be used three to four times a day, which is nearly impossible with flock treatment. Even then its value is doubtful as eyes left untreated often recover just as quickly as those treated.

The cost of treatment is not high for the medicaments used but the loss of time and the cost of employed labour, if used, is quite expensive. Treatment, to be effective, is a full-time job for at least a week.

It can be gathered therefore that mass treatment of flocks is unnecessary, impracticable and uneconomic.

The most practical approach to the disease when it strikes is to give the sheep a good chance to recover naturally, with the minimum of setback, by placing them in a paddock with plenty of food, shade and water. If labour is available, bad cases should be drafted off, segregated and treated at least three times a day for about a week with one of the medicaments listed at the end of this article. This will help lessen the period of blindness and the setback to the small percentage of badly-affected sheep.

Thus, in most cases flock treatment for pinkeye is not advised but the treatment of badly-affected sheep and sheep of special value, such as stud rams, is recommended. In cases where treatment is used it is essential to treat each eye several times each day.

The commonest drugs available for treatment are:—

(1) Chloreomycetin and aureomycin eye ointments.
(2) Penicillin cream or penicillin eye drops (1,000 units/cc).
(3) Sulphacetamide one part and boracic two parts mixed together and blown into the eye by a powder blower.
(4) Zinc sulphate 10 per cent. solution (2 oz. of zinc sulphate in one pint of water).
(5) Argyrol 30 per cent. solution.

In conclusion, do not treat affected eyes with kerosene or dieseline as both are extremely irritant and cause the sheep more suffering than the disease.

USE OF CROSSBRED BOARS DEPLORED

At a recent meeting of the West Australian Pig Advisory Committee, the introduction of the Landrace pig was widely discussed and farmers were warned against the indiscriminate use of cross-bred Landrace boars.

The Committee deplored the high prices being paid for these cross-bred boars, as the progress made in convincing farmers that pure-bred sires are desirable could be nullified if these cross-bred animals were widely used. In any type of livestock breeding, pure-bred sires were desirable as it was most unlikely that cross-breds would breed true to type.

The Committee recommended that the Department of Agriculture should continue its work on making appreciations of the breeds of pigs now in use and particularly of new breeds such as the Landrace.

Concern was expressed regarding the prevalence of virus pneumonia in the State's pig herds, as this disease, besides causing some deaths, commonly resulted in reductions in growth rates and unsatisfactory food conversion figures. The Committee recommended that more publicity be given to this disease and to methods of producing pneumonia-free breeding stock.

Appreciation was expressed, of the valuable work of the Veterinary Branch of the Department of Agriculture in its programme of lice eradication and notification was given that the W.A. branch of the Australian Pig Society was prepared to give financial support to the making of a film dealing with some aspects of pig raising.

● *A salt-tolerant perennial plant which provides good summer grazing is the answer to many salt encroachment problems*

Reclaiming SALT LAND with BLUEBUSH

A furrow on a bare salt flat has trapped seeds of bluebush and the plants are well established

From a Broadcast Talk by S. T. SMITH, Senior Soil Research Officer

IN Western Australia there are approximately a million acres of salt land, some of which is a serious economic problem to individual farmers, unfortunate enough to have the major portion of their properties affected by salt encroachment.

This salt encroachment may take several forms. In the wetter rainfall areas it tends to be mainly confined to the creek and drainage lines, or to seepage areas on hill slopes. These can be quite a problem and every effort should be made to control them, but fortunately the areas affected are seldom of any great extent.

A form of salt encroachment, however, which is more extensive is found in the Eastern Wheatbelt where large areas of powdery morrel soils are found. These soils were some of the most fertile in the district when orginally developed but as a result of clearing and farming, the salt in the subsoil soon came to the surface and left the topsoil bare and denuded. On these powdery soils, wind erosion has become extremely severe, with the result that these areas are potential dustbowls. For instance, I have seen in the Narembeen district, an area of several hundred acres in one piece which is largely devoid of cover and from which clouds of dust arise at the slightest provocation. Again, in the Newdegate district, there are many farms with extensive areas of this type of salt, and I know of at least one case in which a thousand-acre block is completely bare and is littered with exposed stumps of the original vegetation, indicating a very severe removal of topsoil. Similar areas occur in many other districts.

RECLAMATION

These soil types, particularly powdery morrel soil, have fairly large quantities of salt in the subsoil and this salt tends to rise to the surface after clearing. While the farmer is not to blame for his land "going salt" the management which he imposes upon it can influence its future in this respect. However, I believe that most of the land of this type that is subject to salt encroachment is already affected and we are now faced with the problem of reclamation rather than prevention.

The main steps in reclaiming salt land are to maintain a roughened "cloddy" surface and to exercise careful grazing protection. The roughened surface breaks the surface seal which forms on salt land. This allows water to enter the soil, and as it passes down it washes salt from the surface. Seeds hitherto prevented from germinating because of high surface salt concentrations are then able to germinate and plants can become established, provided adequate grazing protection is applied. In this way, mildly salt-affected land can be returned to normal usage. It must be emphasised, however, that patience is required, and repeated workings over several years are often necessary before benefits begin to accrue. This approach, therefore, is quite useful on land where salt encroachment is not excessive. On severely-affected land, however, it is not economic to continually work and sow such land with little or no return. Some other approach, therefore, is essential and it is about this approach that I wish to speak.

A SALT-TOLERANT PERENNIAL

On these extensive areas of severely salt-affected land it is best to establish a salt-tolerant perennial which does not require continual re-seeding, or continual cultivation. Of the plants available, the one which is most valuable for this type of condition is bluebush (*Kochia brevifolia*) and I will confine my remarks to this plant.

Bluebush occurs naturally in widespread situations in the wheatbelt. The bushes are a dark green colour and, when allowed, grow to two or three feet in height. The leaves are small and rounded and very succulent, even after a long dry summer. It does particularly well on morrel soils, is **extremely** drought-resistant, can withstand quite severe grazing and is of very high nutritive value. In fact, bluebush contains more protein than does subterranean clover, and can produce, under Eastern Wheatbelt conditions, 5 to 10 cwts. of dry matter per acre per year. This is a good return considering that it is a plant which requires very little attention other than suitable grazing management.

Bluebush shows most growth during the summer and profuse flowering takes place from January to about May. The flowers, when mature, are very light and papery and are widely scattered by the wind. While this characteristic makes seed collection very difficult it also allows a very easy natural spread. This natural spread is a particularly valuable attribute and it means that, provided a few plants are present, a complete coverage can be obtained over a period of years by imposing suitable management.

What then is this suitable management? The first essential is to have these extensive areas of salt land fenced off from land not so affected. Many farmers are willing to spend a great deal of money on special planting, special tillage and even on special implements to perform the tillage, but claim that they cannot afford to use special fencing. Actually the fencing is the most important part and probably the least expensive. Even if nothing else is done, the salt land should be fenced off where it is of sufficient size to allow this to be conveniently accomplished. Plants have to strive to withstand salt and it is not fair to cope with the extra handicap of grazing animals. I know that many small irregular pieces of salt land are not convenient to fence but, remember, that we are discussing now the more extensive salt areas in the Eastern Wheatbelt.

ESTABLISHMENT

Having fenced off the area of bare salt land the next step is to introduce into it a few plants of bluebush. Naturally, the more plants that can be established the better but, unfortunately, seed of bluebush is not easy to obtain commercially, although it is likely to become easier. A small quantity of seed can, however, be collected by spending an hour or two collecting from existing bluebush plants. This is done by placing a bag over the bushes and shaking vigorously during the January-May seed setting period. The seed available should be sown in June after the rains have begun by cultivating the area and broadcasting the seed on the surface. Quite often, no young plants are visible until the following autumn, so that one should not let the area be grazed on the assumption that planting was a failure. The plants very often become apparent about six to nine months after this initial sowing.

If only a few bluebush plants are established it is desirable to keep the stock out for several years until such time as the plants have scattered their seed and given rise to a reasonable bluebush cover. Keeping the stock out is no real hardship as you will remember we are talking about almost completely bare salt land in the Eastern Wheatbelt, and if the area was bare before treatment began we are not depriving ourselves of any previous grazing area by excluding stock temporarily. After a period of years, when a suitable stand of bluebush is obtained, it can be grazed quite heavily, and a great deal of valuable green fodder, particularly in the summer and autumn, will be obtained. Once well-established it is not easily eaten out and has a very high stocking capacity.

Bluebush, as I said, has a very light seed which is scattered widely by the wind. If, however, the bare salt surface is left in a smooth condition, the seed cannot remain on the area and will be swept off by the wind. For this reason, it is desirable to roughen the surface in such a way that the seed will be retained. If bare morrel soils are cultivated with a scarifier they tend to blow very badly. If, however, they are furrowed with an implement with furrows about 10 yards apart on a checkerboard pattern it will be found that the wind erosion will be minimised to an extent where it is no hazard at all. Furthermore, this very inexpensive type of working is ideal for catching the seed of bluebush and allowing it to become established. In this way, the desired stand can gradually be developed.

In this State there are many extensive areas of salty morrel soils which are producing nothing and which are merely an erosion hazard which allows dust to blow about in the summer to the annoyance of many and particularly to housewives. This need not be so, as such areas can not only be stabilised but can be turned into reasonably productive fodder areas. Bluebush can do this, provided suitable management is imposed, and I have tried to show that the management necessary is early grazing protection, together with suitable cultivation. Bluebush needs only to be introduced and under this suitable management will distribute and establish itself. What could be more economical?

PIGLETS NEED WARMTH

Over 20 per cent. of piglets born in Western Australia fail to survive to weaning age. That means 20 out of every 100 or 200 out of every 1,000 die before they are two months old.

There are several causes for this high death-rate but it is safe to say that a very high percentage of the deaths occur in the first few days of life and many of them are due to chills.

Before the piglet is born it is cradled in a warm uterus at a temperature of 102°F, getting a steady supply of energy from the sow's bloodstream.

Soon after birth the piglet only weighs about 2 lb., much of which weight is in its head and legs with very litle body fat to insulate it against changes of temperature. Imagine what it has to withstand when the temperature drops from 102° to 60° or even 40° on a cold night!

You can help the piglets to survive by providing snug draught-free farrowing pens and by fitting infra-red heater lamps or heaters fuelled by kerosene or butane gas. The artificial heating is usually only required for the first two or three days, by which time the piglets have developed their heat-regulating system.

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The Burnett Control Gate for Irrigation Channels

Described by B. SWAN, Adviser, Irrigation Branch

THIS type of check-gate for use in irrigation ditches, was evolved on the Kimberley Research Station and has definite advantages over wooden or concrete structures in that it is termite-proof and can be removed and replaced in a few minutes to permit of the channel being cleaned out by straight runs with modern machinery.

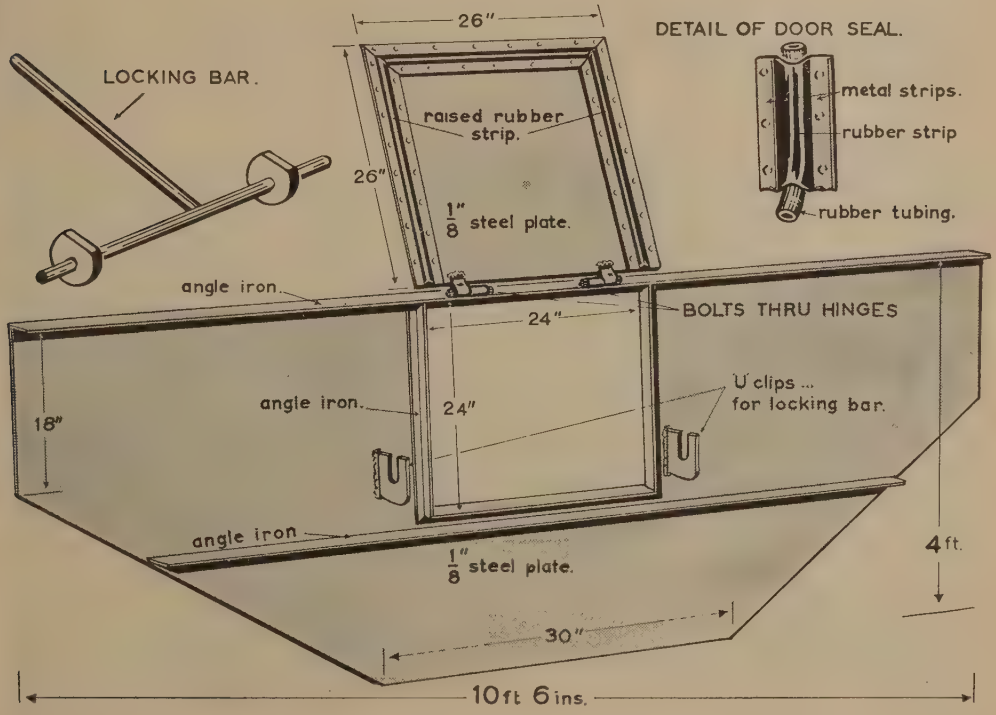

Fig. 1.—Details of the Burnett control gate

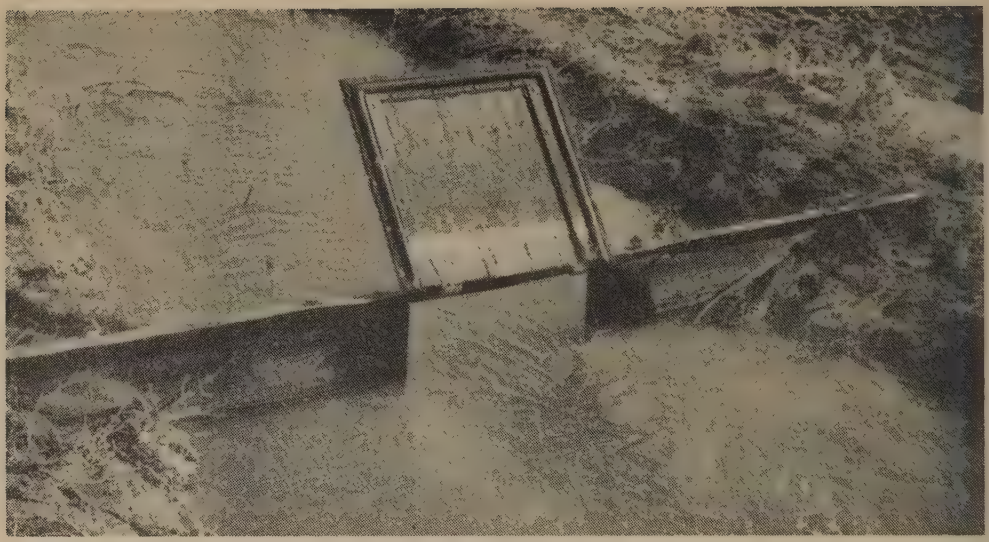

Fig. 2.—The gate opened

It is constructed of $\frac{1}{8}$ in. steel plate, reinforced with angle-iron welded across the upper edge; round the water-gate; horizontally across the middle, and vertically as shown.

The opening of the water-gate is 24 in. square, the door itself being 26 in. square. The door is reinforced with angle-iron on the back. The front, where it presses against the angle-iron of the door opening,

Fig. 3.—Water-gate closed and locked

carries strips of rubber overlying thick small-bore rubber tubing, these being held in place by thin narrow strips of metal bolted along the edges about ¾ in. apart. The rubber gives a perfect seal when the door is closed and locked by the T-shaped bar.

Two short lengths of metal piping welded to the door, and two L-shaped lengths of round iron welded to the top angle-iron serve as hinges.

The locking-bar is made from piping or round iron carrying two discs of ¼ in. plate with a flat on one-quarter of the circumference. The bar drops into two U-shaped brackets welded just clear of the door at either side of the water-gate. It is placed in position with the two flats of the discs towards the door. A downward pressure of the locking-bar handle forces the rubber seal tightly against the angle-iron frame of the water-gate.

To open the check-gate, the handle is lifted, the locking-bar removed and the gate is swung upward. It is quite a simple matter to close and lock the gate, even against a full head of water in the channel. Similarly, the pressure of water behind the gate does not greatly affect removal of the locking-bar.

The Burnett control gate is light enough to be handled comfortably by two men when placing it in position or shifting it to another site. It can readily be removed and replaced to permit a straight run-through with machines used to clean out the channel.

To put the check-gate in position, a narrow trench is dug across the channel and the edges of the check are buried 6 to 9 in. in the soil.

The angle-iron reinforcement along the upper edge is extended about 6 in. on each side so that a lever or a jack may be used to lift the gate and facilitate removal.

FRUIT FLY

Losses by growers and consumers of fruit through fruit fly infestation is causing considerable concern over the State, and particularly in the fruit-growing areas in the South-West.

The importance of reducing these losses is recognised by the Government, which has approved of increased endeavours along lines which experience has shown could bring quick results. These measures include the appointment of additional Inspectors, publicity, particularly of an educational nature, with the view to enlisting the support of the public generally, sterilisation of fruit in the metropolitan area by fumigation, the provision of road blocks to check vehicles carrying fruit into prescribed clean areas, and a stricter enforcement of regulations covering preventive measures both in commercial and backyard orchards.

The Western Australian Fruit Growers' Association is working in close co-operation with the Department of Agriculture and is assisting in the meeting of expenditure incurred.

A comprehensive plan has been prepared, and provision has been made for the appointment of Inspectors at Collie, Narrogin, and Katanning, and three additional inspectors in the metropolitan area. An additional inspector has been stationed at Albany, where it is hoped to eradicate the isolated outbreak; and a further appointment at Bridgetown will be made when necessary.

The Department is already taking a stricter view of offences against regulations particularly in the metropolitan area, as the policy of advising householders to take action and the issuing of a warning has not proved very effective.

The Metropolitan Market Trust has commenced the erection of fumigation chambers at West Perth, where it is intended eventually to fumigate all fruit during the period that the fly is active, which will not only be a boon to consumers—particularly of stone fruit—but will safeguard clean areas to which fruit is sent outside the metropolitan area.

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● Pest numbers are lower than ever before, but only constant vigilance can prevent a build-up

Vermin Control in W.A.

By A. R. TOMLINSON
Chief Vermin Control Officer

THE annual report of the Agriculture Protection Board of W.A. for 1958-1959 indicated that while vermin control had continued at a relatively high standard throughout the State, most of the animal and bird pests were at the lowest level within the memory of most people. However, there were ample warnings that any relaxation in control work could have rapid and serious consequences.

Rabbits must still be regarded as the most important pest even though at the present they could be placed more in the potential threat class. Their numbers increased following last year's excellent winter season and this was most noticeable in the lower agricultural regions. An extensive build-up was halted by myxomatosis outbreaks, the expanded poisoning drives involving the "1080" units and other work such as warren ripping and spot poisoning. By the end of summer numbers had fallen again but there can be little question that in some localities there were more than at the same time in the previous year. It is this almost imperceptible and insidious building-up process which has always made rabbits so dangerous and so difficult to handle.

As a result of favourable seasonal conditions, very big increases occurred on the Nullarbor Plains and along the North-West coast from Shark Bay northward. Myxomatosis and the arrival of harsher conditions reduced the populations just as rapidly as they had built up.

Myxomatosis was widespread, following conditions which were probably the most favourable for the transmission of the disease since it was introduced. Some isolated outbreaks were of a high mortality rate but most were at a low grade and many of the diseased rabbits recovered to become permanently immune. Blood samples taken from diseased rabbits showed a substantial decline in the effectiveness of the disease generally.

In the poisoning drives involving A.P.B. units using "1080" poison, nearly 30,000 vials of "1080" were used in 210 tons of bait. This was distributed over 44,000 miles of trail on 8,600 properties at an average cost to each farmer of £3 18s.

WILD DOGS

Wild dogs were reduced to the lowest numbers since the bonus scheme was commenced in 1928. Only just over 5,600 scalps were produced which is 2,600 less than last year. This is the lowest total on record and is well below the maximum of 19,000 in 1945. Nearly 5,300 of the scalps came from pastoral districts and over 1,300 of these were obtained by A.P.B. doggers.

Less than 370 scalps came from agricultural areas and more than 300 of these were presented by A.P.B. doggers.

A.P.B. projects such as aerial and ground baiting, the employment of doggers and the combined drives with landholders and Road Boards have taken advantage of what seems to be a natural reduction, possibly in a type of population cycle. Especial mention must be made once again of the gradually extending zonal destruction drives organised by pastoralists in conjunction with Road and Vermin Boards in the North-West and Central pastoral districts.

Aerial baiting was carried out again in pastoral and agricultural districts. While much good is being done by this baiting, the lack of suitable aircraft for the purpose is a serious restriction.

FOXES

The bonus on foxes was discontinued on December 31, 1958, for a three-year trial period. The number of scalps handed in during the six months from July 1, 1958, was about 2,000 less than for the same period in the previous year, indicating a population drop. It is anticipated that the big fall in fox numbers apparent since the reduction in their main food supply—the rabbit—will continue until a minimum level is reached. After that they will build up again until they reach a level balanced mainly by seasonal conditions and availability of food. Our experience has shown that this balance is not materially affected by the destruction measures dependant on bonuses.

As an alternative to the bonus which had become generally recognised to be ineffective, the organisation of concerted baiting drives by farmers prior to lambing was commenced. These drives were supported by A.P.B. units which baited Crown lands and reserves simultaneously. The units continued to operate after the drives had ceased. One of the main purposes has been to educate farmers to the necessity and methods of baiting.

Many farmers, previously reluctant to use poison baits, have joined in the prelambing drives. However, it is clear that most farmers are only interested in giving foxes a severe check each year prior to lambing. They are not concerned in dealing with them at other times or in endeavouring to eliminate them or even in permanently reducing them.

EMUS

Only just over 9,600 emu beaks were paid for, which is the fourth lowest number on record and much less than the highest total of nearly 60,000. However, during June the commencement of migratory movements was observed along the northern sections of the vermin fences. The 120-mile long Lake Moore emu barrier fence and the 12-mile long Ajana spur fence were completed at a total cost of £67,000. These will give good protection against emu invasions to the areas concerned. Preliminary steps are being taken for a 150-mile fence around the Yilgarn and Westonia districts.

GRASSHOPPERS

While grasshoppers remained well under control, the egg-laying period was extended by particularly favourable conditions and gave every indication of a potential threat if conditions for hatching in early 1959-60 were just as good. It is now past history that the conditions were exceptionally good and led to a general increase with an outbreak in the Bullfinch

area being possibly one of the severest infestations which has ever occurred in W.A. The situation will need very careful watching and possibly drastic action, otherwise there could be a serious and costly extended plague.

KANGAROOS

Kangaroos have continued to cause concern and, although the open season in lower agricultural areas has been continued for a further two years, complaints of damage by them continue to be received.

Euros appear to be giving trouble to North-West pastoralists many of whom are convinced that no improvement of the degenerated Pilbara areas can be obtained until the euros have been exterminated.

Along the Fitzroy River in the Kimberleys very successful baitings of wallabies were conducted using rice flour baits poisoned with strychnine. Unfortunately, the effectiveness of these operations was greatly reduced by the failure of some stations to participate.

Large concentrations of red kangaroos were reported in various pastoral centres. In two years over 200,000 have been shot by carcass and skin hunters operating from the Cue centre, but large numbers still remain.

Investigations into control measures were continued by A.P.B. research officers and it is encouraging to know that similar investigations are to be conducted by the Northern Territory and Queensland authorities. The C.S.I.R.O. which has been studying the euro problem here, is also commencing on the red kangaroo in N.S.W.

WILD DONKEYS

The wild donkey situation in the Kimberleys led to so much concern that large-scale shooting drives have been organised. A drive was conducted very successfully south of Port Hedland. Concentrations reported in the Meekathara district for several years have been allowed to build up and extend unchecked.

Other pests worthy of mention were buffaloes, which appeared in the East Kimberleys, wild camels, pigs, goats and horses which are worrying property owners in various localities. A Ceylon crow was destroyed at Kwinana.

Research into methods of controlling various pests was conducted. This included rabbit poisoning, particularly the short-cutting of "free" feeding with unpoisoned bait, population checks and pasture consumption. Improved baits for wild dogs and foxes have been the subject of intensive research as well as emu poisoning.

Trials of a "killer" scheme to control rabbits were commenced in two areas and are continuing. It has been noticeable that results generally have been much better than in nearby localities outside the experimental regions although the work has been confined largely to poisoning using the same methods which are recommended for general use.

A very pleasing feature was the expansion of the Group vermin control scheme so that 75 out of the 81 boards in agricultural districts were participating. This scheme which involves the joint employment of A.P.B. officers by groups of road boards in conjunction with the A.P.B. is probably the most successful co-operative venture of its kind. It has achieved a close partnership and understanding between farmers, boards and the A.P.B.

Generally, 1958-1959 was an outstanding season from the vermin control angle, but unfortunately there are no indications that any of the pests have been exterminated. Those that are being kept down at present are only too obviously awaiting any relaxation in control work in order to build up once more, particularly with the aid of the great impetus they obtain under any favourable seasonal conditions.

HONEY, PEANUT, RAISIN COOKIES

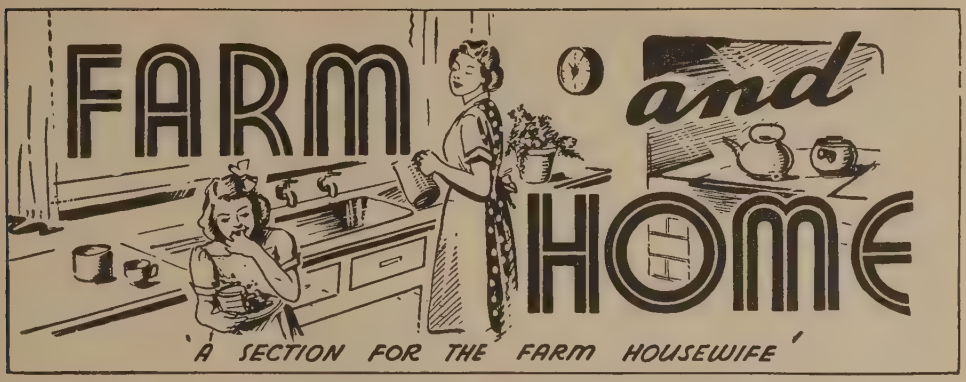
- 1 cup margarine
- ½ cup honey
- ½ cup brown sugar
- ⅓ cup milk
- 2 cups flour
- 1 teaspoon baking powder
- 1 teaspoon soda
- 2 cups quick cook oats
- 1 cup chopped raisins
- 1 cup chopped peanuts

METHOD:

Cream butter, add honey and brown sugar, then add remainder of ingredients in order given.

Roll a teaspoon of dough in the hands, place on an ungreased baking sheet, flattened a little. Bake in a medium oven for 15-20 minutes.

This recipe makes about 50-60 cookies.



Snacks with a Difference

By HELEN M. GLOSTER

FOR those who like to try something a little different, these recipes will strike a new note and I think that they will prove popular with most members of most families.

CHEESE-STEAK

Ingredients—

2 lb. stewing steak.
Salt, pepper, paprika or cayenne.
Plain flour.
2 tablespoons good dripping.
2 onions, sliced.
½ cup vegetable water.
½ cup thick sour cream.
2 tablespoons finely grated cheese.

Method—

1. Cut meat into serving portions.
2. Season with salt, pepper, paprika.
3. Score meat well on both sides, roll in flour.
4. Brown onions slowly in fat.
5. Remove onions and brown meat well.
6. Add onions, vegetable water and cream.
7. Cover and simmer until meat is tender.
8. Remove cover, stir in cheese.
9. Serve at once.

This recipe makes about eight serving portions.

N.B. Care must be taken not to cook mixture after cheese has been added as overheating toughens the cheese.

"PRONTO PUPS"

The children will relish these, especially if they are having a party with some of their young friends.

Ingredients—

Sausages.
Batter.
Fat for frying.

Method—

1. Simmer sausages in water about 10 minutes (longer for pork sausages). Allow to get cold and firm.
2. Fasten each sausage securely to a wooden skewer, or to one of those flat sticks now used for many ice-cream novelties.
3. Dip each sausage in batter and deep fry in fuming fat.
4. Serve each sausage on a stick out of doors barbecue fashion.

FLORIDA "HUSH PUPPIES"

The unusual name of these cakes is said to have originated in the days when Florida hunters sat around their camp fires eating "fish-fries." When their dogs whined for the fragrant smelling food, the hun-

ters would toss left-over corn patties to them, calling "Hush, puppies." Satisfied, the dogs hushed.

In Florida these corn cakes are served with fried shrimps and cole-slaw.

They could be served with hot meat and fish dishes.

Ingredients—

*3 cups corn meal.

2 level teaspoons baking powder.

1½ level teaspoons salt.

1¼ cups milk.

Barely ½ cup water.

1 egg (if liked).

1 finely chopped onion (if liked).

Method—

1. Beat together meal, baking powder, salt, milk, water.

2. Blend in egg and onion.

3. With the hands mould into little cakes (about one tablespoonful each).

4. Shallow fry in fuming fat until nicely browned, then cook more slowly until cooked through. Drain on kitchen paper.

5. Serve very hot.

N.B. If preferred, Hush Puppies may be deep fried.

JOHNNY CAKES

This is a North American recipe. The name is a corruption of "Journey Cakes." In South America, similar cakes are known as tortillas.

Ingredients—

¼ lb. Indian corn meal.

½ lb. plain flour.

2 oz. butter.

½ pint milk.

¼ lb. castor sugar.

3 level teaspoons baking powder.

3 eggs.

Salt.

Method—

1. Sieve the meal, flour, baking powder into a mixing bowl.

2. Rub in butter with finger tips until mixture resembles fine breadcrumbs.

3. Add sugar, mix well.

4. Make well in centre of mixture.

5. Beat eggs well and add milk.

6. Pour liquid into centre of dry ingredients and mix from centre outwards until all dry ingredients are mixed.

7. Beat mixture quickly for a few minutes and pour into a well-greased cake tin.

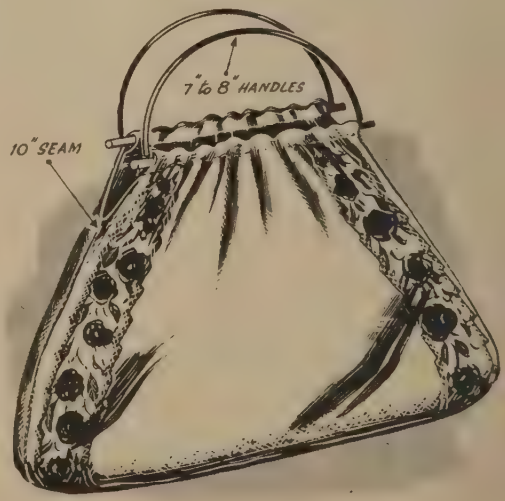
8. Bake in a moderate oven until well risen and browned, 30 to 45 minutes.

9. Serve hot cut in slices and buttered.

N.B. This cake is not very appetising served cold. If not required at once it may be toasted and buttered just before serving. Serve with hot meat dishes.

A NOVEL SHOPPING BAG

Did you receive any of those gay-patterned tea towels for Christmas? They are far too pretty to use for drying the plates, don't you think? Why not make a



*"Corn meal" is available in Perth under the name "maize meal." It should not be confused with maizena and cornflour, which are finely ground. Maize meal, sometimes known as "Indian corn meal" is coarse like the wheat meal sold for making wheaten porridge. The price is 1s. 9d. per lb.

shopping bag? The tea towel usually measures about 30 x 18 inches.

You will need to buy a pair of handles.

There are plenty of these available either round or half-moon shaped, and they are made of cane, wood or plastic.

A half-moon shaped pair measuring 7 or 8 inches across the base will do nicely for the bag.

Method—

1. Fold tea towel in two.

2. Machine sides together for about 10 inches to form the bag.

3. Turn an end over the base of each handle and machine or handsew firmly, enclosing base of handle.

TO LINE AN EVENING STOLE

Did you make the evening stole illustrated and detailed in the May-June 1959 issue of the Journal? There will come a night when you will need extra warmth around your shoulders between dances.

The lining of the stole is a very simple matter.

Take a length of flannel the same width and slightly shorter than the stole. Slip this inside the stole.

A large woollen scarf slipped inside the stole is sometimes all that is required to provide that extra warmth.

Woollen interlinings as a rule do not need to be sewn to the stole. The fluffy nature of the wool keeps it from slipping out of position.

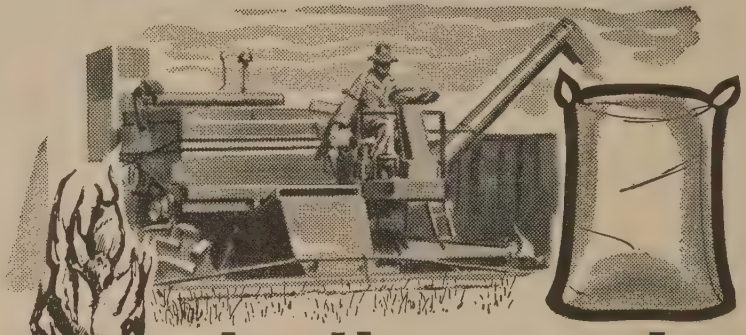
Former Scrub Plain Produces Well

Inspecting the first cereal crop at the Eneabba War Service Land Settlement area. This is the first large-scale attempt to develop the coastal plain between the Midland Railway and the coast. About 150,000 acres are included in the area which has been surveyed into 44 farms. The annual rainfall averages 20 to 25 inches and the district has a longer growing season than the inland areas.

Cereal crops were sown on two-year fallow and yielded fairly well but the emphasis will be on wool and meat production.

"Ceresan" Dry-seed Pickle

more bushels . . .



to the acre !

Whether it be wheat, barley or oats you are sowing — the one pickle that gives you the greatest disease control is ICI "CERESAN" . . . follow Departmental recommendations.

Published overseas reports state that the increase in root rot diseases in cereals may be due to the use of seed dressings which control **only** bunt of wheat.

PICKLE WITH

When your Wheat Grader calls - DEMAND . . .

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. . . you'll reap a full crop every year and remember
IT'S YOUR INCOME YOU'RE GROWING!

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● *Reconstituted dried buttermilk gives good results, is convenient to store and use, and costs less*

Cutting Costs in Calf-Rearing

An experiment described by N. A. SCOTT, Manager, Bramley Research Station

RAISING calves as herd replacements and as a sideline to provide added income is becoming increasingly popular. This is particularly noticeable since the inception of the Artificial Breeding Scheme whereby farmers are at liberty to breed herd replacements from their most productive cows and use semen from beef breeds for the poorer types.

Where separated milk is available this is the logical food for the calves. Dairy farmers who sell wholemilk for human consumption or for processing, are faced with the necessity, however, of using wholemilk or purchasing milk substitutes. It is unlikely that the purchase of a separator would be justified so that separated milk could be made available for calf rearing.

Since 1953 dried buttermilk has been used in increasing amounts as a milk substitute in calf feeding. Trials carried out at the Bramley Research Station (Snook, 1958) showed that reconstituted dried buttermilk was a cheap and convenient food for calves. As an alternative, however, consideration has been given to the use of wholemilk. In most herds there are cows which yield large volumes of milk that is comparatively low in butterfat. Where returns are based on butterfat content, this milk, particularly if collected in the morning, may be quite an economical feeding stuff for calves. In order to obtain positive information a trial has

A group of the experimental calves with one of the moveable shelters

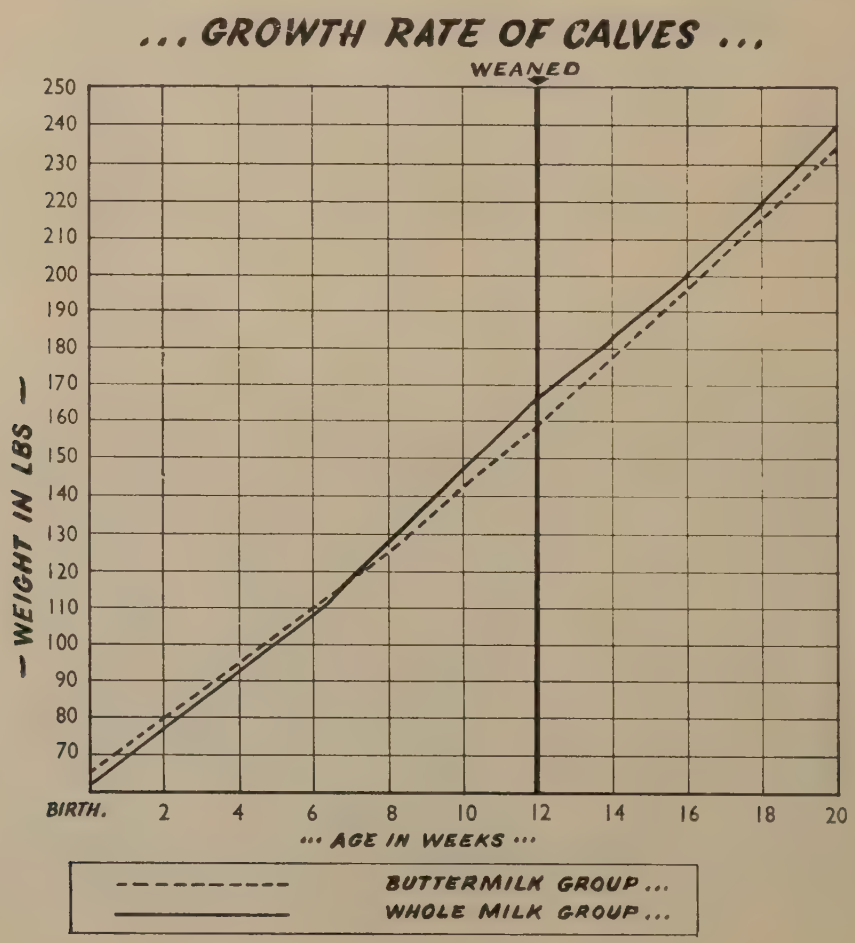
been conducted at the Bramley Research Station to determine the relative merits of wholemilk (low in butterfat) and reconstituted dried buttermilk.

EXPERIMENT

Two groups of nine calves were chosen according to their date of birth, weight at birth, breed and sex. Each received colostrum for the first week after birth. During the following week one group of calves were gradually converted to a ration of reconstituted buttermilk. At the end of a fortnight, each calf was receiving 1¼ lb. daily, which is the equivalent of 1 gal. of wholemilk. The powder dissolves readily in warm water, and although the quantity of water required is not of major importance, 1 gal. per head daily is allowed.

The other group of calves, following the before mentioned colostrum feeding, were fed on wholemilk at the rate of 1 gal. of milk containing 3 per cent. butterfat per head daily.

At 12 weeks of age, both groups of calves were weaned on to good quality pasture. This should be leafy, green and not too rank in growth. Each week the calves were shifted to a fresh paddock. During the hand-feeding period, generous amounts of hay were fed, fresh water was



Graph showing the growth of the two groups of calves

available and shelter was provided by moveable sheds. The latter were shifted when ever the ground became soiled, thereby eliminating the unpleasant task of shed cleaning. Cobalt deficiency was corrected by spraying the pastures with 2 oz. cobalt sulphate per acre. This was added to the insecticide whilst carrying out insect control measures.

RESULTS

Although the calves fed on reconstituted buttermilk were more prone to dirty tails and rough coats, the accompanying graph will indicate that there was no significant difference between the weights of the two groups.

It is also apparent that at no stage during the trial was there a check in growth, one important factor in rearing healthy calves.

The following table shows the costs of the respective foods:—

Food Type	Wholemilk	Whole and Buttermilk
Quantity	1 week = 7 gal. Colostrum 11 weeks = 77 gal. Wholemilk	1 week = 7 gal. Colostrum 1 week = 3½ gal. Wholemilk, plus 4 lb. buttermilk 10 weeks = 87½ lb. buttermilk powder
Cost	22 1 lb. butterfat at 4/3½ (processed milk price)	3½ gal. (1 lb. butterfat) wholemilk 4/4 91½ lb. buttermilk (88/- per 100 lb.) £4/0/6
Total	£4 18s. 8d.	£4 4s. 10d.

One disadvantage of wholemilk feeding in the case of Channel Island breeds, is the difficulty in reducing the milk to 3 per cent. butterfat test. For those farmers holding their milk in cans overnight an approximate 3 per cent. level can be obtained by tipping off the top half of the milk and feeding the remainder to the calves.

For the breeder favouring heavy milk-producers, the matter is a simple one. There is usually an odd cow with a low percentage test, or if necessary, the morning milk only can be fed, this having a much lower butterfat content.

Buttermilk can be fed in dry form, from approximately five to six weeks of age. If a little is placed in a trough in a dry place, the calves learn to lick it at an early age, and labour can be considerably reduced. Care, however, should be exercised in not allowing greedy calves to dominate the feed trough.

CONCLUSION

Healthy calves can be raised economically on wholemilk low in butterfat, and on reconstituted dried buttermilk.

The cost of rearing such calves should be less than £5 per head for milk which could be sold, or £4 10s. for dried buttermilk which has to be purchased.

Calves can be weaned on to good young pasture at 12 weeks of age without any check in growth rate.

REFERENCE

Snook, L. C. (1958).—West. Aust. J. of Agric., 3: 319.

VERMIN FENCE TO BE ABOLISHED

The Minister for Agriculture. (Mr. C. D. Nalder), announced recently that it had been decided to discontinue the maintenance of the southern section of the No. 2 Vermin Fence from Nyabing to the south coast. This length was kept temporarily when the fence to the north was disposed of a few years ago, but it has now reached a stage where much of it requires replacement. It is considered that the cost involved is not warranted, particularly in view of the existence of a vermin fence along the boundary of Jerramongup and Gairdner River land settlement areas, a short distance to the west of the part of the fence now to be abandoned.

The part of this section in best condition is at the northern end and the few farmers whose properties adjoin the fence will be given the opportunity of purchasing, at a price yet to be determined. The balance will be sold for removal or will be dismantled.

MOVEMENT

For ever the winds blow—for ever the waters move—not for one moment since creation have they been still—movement precedes everything we know.

There could be no earth without movement, no universe, no life. But for the movement of the ocean there would be no health on this planet. But for the movement of the seed, there would be no grass. But for the movement of man's brain, there would be no history.

Elders have come a long way since that day 120 years ago when, from a small beginning was born a company that has moved forward to become a symbol of integrity and trust. The trust placed in Elders has grown as a direct result of the service we offer and a carefully planned policy of progress—a policy that keeps us a pace ahead of progress, thereby giving you the assurance that

YOU CAN ALWAYS RELY ON

Elders

Australian SPARK ARRESTER TESTS

TEST No. SPA–3, STOCK MODEL, DECEMBER 1957

SPARK ARRESTER FOR INTERNATIONAL B-250

TESTED FOR INTERNATIONAL HARVESTER Co. OF AUSTRALIA, GEELONG

FORMAL tests on spark arresters are conducted by The Tractor Testing Committee* at the Testing Station, Werribee, on behalf of those companies concerned with tractors, engines or spark arresters who wish to have these equipments tested. The arrester is tested on the engine it is specially designed for (as in this instance), or if it is sold for use on any or several engines, it is tested on an engine of the highest power for which the spark arrester is intended.

1.—Test Procedure.

The method of test is based on a procedure standardised by the Society of Automotive Engineers (U.S.A.). This consists of feeding a weighed quantity of carbon particles of given size into the exhaust of the working engine, and then catching in a trap, and weighing, the particles that the arrester allows to pass through. Separate runs are conducted with particles of larger and smaller size; in some runs the engine is working at full load, in others at fast idle under no load.

According to the S.A.E. standard, no particles of the larger size should escape the arrester, and not more than 10 per cent, of the smaller size. At the same time the extra back pressure imposed on the exhaust system by the presence of the arrester should be no more than 10 inches in a water barometer.

2.—Name and Type of Arrester: "B-250".

Submitted by: International Harvester Co. of Australia Pty. Ltd., Geelong, Victoria.

For Particular Tractor: International B-250 Diesel.

3.—Brief Specification of Arrester.

Operating Principle: Perforated screen.

Declared Maximum Horse-Power: Not stated.

Dimensions: Exhaust pipe, diameter 2 inches. Tail pipe, diameter 2 inches; length 5 inches. Arrester, outside diameter 5¼ inches; length 9½ inches; weight 6 lb.

Materials: Mainly 16-gauge steel. Screen, 26-gauge perforated, stainless steel.

Mounting: Vertical, ahead of operator, effluent upwards.

Details of Test Engine: International B-250 (Tractor). 27 horse-power maximum; 140 cubic inches; rated speed, 1,800 r.p.m.

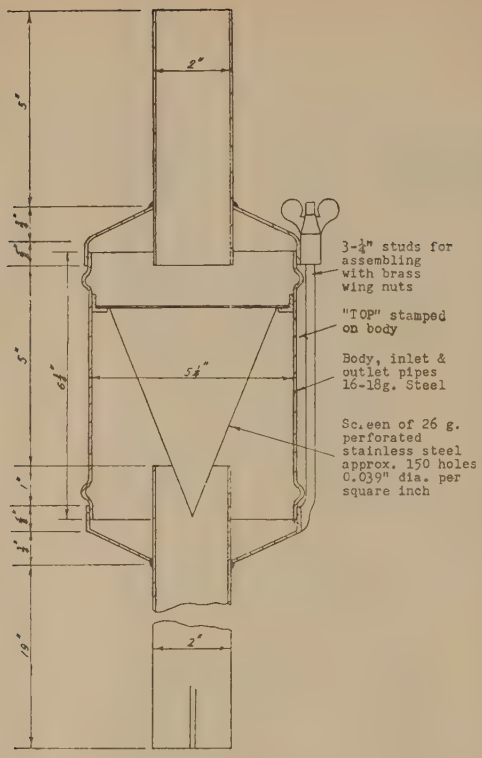
4.—Summary of Test Results.

(Particles injected at rate of 100 gms. in 18-20 minutes.)

(a) Effectiveness of Spark Arresting:—

Particle Size	Engine Load Condition	Carbon Passing Arrester (Percentage)	Remarks
Large	High	....	Two tests
Large	Low	....	Two tests
Small	High	4·0	Average of two tests
Small	Low	1·0	Average of two tests

* The Australian Tractor Testing Committee is a joint body established by agreement between the Commonwealth, the States, and the University of Melbourne; under this agreement the tests are carried out by the University of Melbourne. The address of the Tractor Testing Committee is: c/o Department of Primary Industry, 301 Flinders Lane, Melbourne.


2"
5"
3-¼" studs for assembling with brass wing nuts
"TOP" stamped on body
Body, inlet & outlet pipes 16-18g. Steel
5¼"
Screen of 26 g. perforated stainless steel approx. 150 holes 0.039" dia. per square inch
2"

International B—250 Spark Arrester

A.T.T. No. SPA 3, December, 1957

(b) Back Pressure: At High Load, 9 inches water. Changes during test 7-11 inches water.

(c) Temperatures: Not taken.

(d) Noise Levels: Not taken.

NOTE.—This report makes no promise about the likely performance of the arrester other than in the condition supplied for test, i.e., new.

5.—Comment.

Risk of Bad Fitting through Damage: The two sheet-metal ends fit over the sheet-metal shell; if the fitting at the lower (inlet) end is imperfect, e.g., through denting by damage then unscreened carbon particles could escape.

Screen Openings and Material: The screen consists of perforated 26-gauge stainless-steel sheet, approximately 150 holes per square inch, the holes being 0.039 inches diameter (slightly bigger than the "small carbon" size). On inspection after the tests it was found that a proportion of the holes—roughly 5 to 10 per cent. —were blocked up with particles which were difficult to remove.

There were indications that this accumulation of carbon had been burned off during high-load runs. It is understood that reliance is placed on this burning-off from time to time, in order to keep the screen clear. Nevertheless, overseas tests suggest that burning of this kind leads to rapid failure of screens unless made of nickel-chromium alloys.

Compared with iron-wire screens, the use of stainless steel in the form of perforated sheet would be expected to give a longer life.

Prospective Life: It is impossible to estimate the probable life of the screen; it is, however, easily replaced, and the makers expect it to be regularly inspected, and, if necessary, be renewed each season.

Subsequent tests for 1,000 hours at full load, reported by the applicant company suggest that the stainless-steel screen is virtually unimpaired after such service, and that it is likely to outlast the shell.

University of Melbourne, 13th December, 1957.

W. F. BAILLIE, Testing Officer.

G. H. VASEY, Officer in Charge, Tractor Testing.

★ *SOUTH-WESTERN AUSTRALIA IS FORTUNATELY FREE FROM MOST OF THE HARMFUL SPECIES*

Ticks

AFFECTING ANIMALS IN AUSTRALIA

From a Broadcast Talk

By J. SHILKIN

Assistant Chief Veterinary Surgeon

Fig. 1.—Cattle ticks on the neck of an experimental animal at the C.S.I.R.O. Veterinary Parasitology Laboratory

WHILE there are many external parasites affecting animals in Australia, information in regard to their geographical distribution and incidence is far from complete. However, there is little doubt that the ticks, and in particular, the cattle tick, are the most important of these parasites in Australia. We are fortunate that many species are not present in this country, as some of them are carriers of serious diseases of both man and animals.

Certain of the ticks not present in Australia are confined to Europe, Africa or the American Continent, but some occur in South-East Asia or the islands between there and Australia. In the early period of settlement of Northern Australia, cattle, buffaloes and horses were imported from the East and from early times a miscellaneous collection of native vessels commonly carrying dogs, pigs and goats have visited North Australian ports and coastal aboriginal settlements, in the course of trading operations. It seems rather remarkable therefore, that except for the cattle tick, the bush tick, the fowl tick and the brown dog tick, no others were introduced.

As far as Australia is concerned, the cattle tick, the fowl tick and the scrub or dog tick are the species of particular importance.

From time to time other ticks have been found on animals brought into Australian ports but have not been introduced as the infested animals have either not been landed, or have been cleansed prior to entering quarantine.

THE CATTLE TICK

The cattle tick, whilst mainly found on cattle, may also be found on horses and occasionally on sheep, pigs, dogs, rabbits and certain of the marsupials. It was probably first introduced into Australia at Darwin in 1872 with Brahman cattle from Batavia. Some escaped and the survivors of these were taken to Adelaide River where they mixed with station cattle.

From the Northern Territory the tick spread east to Queensland and west to this State, and from Queensland it ultimately reached Northern New South Wales.

At present, Queensland, Northern Territory and the Kimberley area of Western Australia are widely infested as well as the northern part of New South Wales where

Fig. 2.—A female cattle tick laying a mass of eggs. The photograph is about five times natural size

a Board of Tick Control has been in operation for many years and has been responsible for clearing big areas and limiting the southward spread of the tick.

Climatic conditions limiting the spread of the tick have not been ascertained with any certainty, but as the adult tick is susceptible to low temperatures and the eggs and larval tick to low humidities, it is possible that the cattle tick will never reach severe proportions in localities where the grass temperature is frequently below freezing or where the relative humidity is always below 70 per cent.

However, throughout Australia, active steps are continually being taken by restriction of movement of stock, dipping etc., to ensure that spread does not occur.

At present in Western Australia, the limit of southern spread is in the vicinity of Anna Plains Station, north or Port Hedland.

Ticks have been found in and around Perth and even as far south as Manjimup in 1897, 1906, 1913 and again in 1921-22. Fortunately none survived and although there may be some doubts as to whether they would, no risks are taken and quarantine restrictions in relation to Kimberley cattle, which are also applied for the control of Contagious Pleuro-pneumonia as well, are designed to ensure that ticks are not introduced outside the areas already infested.

Where ticks occur, they not only cause considerable tick-worry on cattle purely by mechanical means, but in addition, many of them carry small blood parasites which are responsible for the disease "Tick Fever" or "Redwater."

When ticks first spread through Northern Australia, losses from tick fever were enormous, from 60 to 80 per cent. of the cattle dying from that disease, but as the stock in tick infested areas are now largely resistant, losses are very much less serious, although far from negligible. As long as cattle are exposed to tick infestation, the immunity to tick fever generally persists, and so in affected areas, the eradication of the tick is not generally attempted, but is controlled by various means in some areas.

In the Kimberley region of this State no steps are taken to control the tick on properties where infestation occurs. Under the conditions prevailing in these areas, control measures would be most difficult, but peculiarly, there are areas and properties which are tick-free.

This fact poses problems in the movement of stock as cattle from tick-free areas moving through tick-infested areas run the risk of contracting tick fever, owing to their lack of immunity.

Dipping has been the principal method of control and arsenical dips were regularly used for many years. About 1937 it was found in Queensland that ticks in some areas were becoming resistant to arsenic. After World War II, DDT became available and it was found to have considerable value where arsenic resistance was encountered, and it has since been used widely in Queensland since then.

There has been considerable investigational work in Queensland and New South Wales into the question of control and eradication in recent years, and this is still going on.

However, cattle owners in the south-west areas of this State are most fortunate that it is not one of their worries, and that regular dipping of herds has not to be carried out for this purpose.

THE BUSH TICK

Cattle are also the normal hosts of the bush tick which, however, is confined

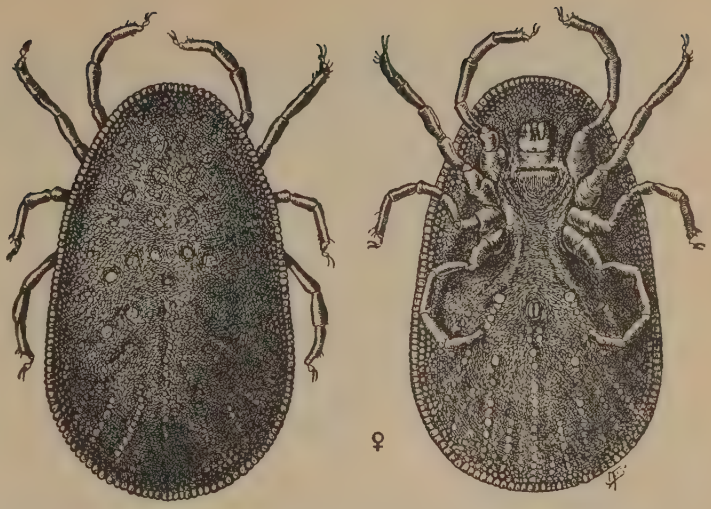


Fig. 4.—Enlarged drawing of the female fowl tick, showing dorsal and ventral views. Natural size is about one-third of an inch

mostly to the coastal and sub-coastal districts of Queensland and New South Wales, and while it may cause some ill-effects in cattle due to loss of blood, its presence in areas where the cattle tick also occurs, and where dipping and spraying are regularly undertaken for the control of this parasite, renders the bush tick relatively unimportant.

It is capable of transmitting a parasitic disease of dogs, but fortunately the blood parasite responsible is not present in Australia. However, it is possible that it can act as a mechanical distributor of Q. fever which can be a serious disease in humans.

THE POULTRY TICK

A tick of some importance, however, is the poultry or fowl tick which may affect domestic fowls, ducks, turkeys and pigeons, and has also been found on caged canaries.

The fact that it is so widely distributed, particularly in far inland areas, suggests that is was not introduced initially but is indigenous. However, it is quite likely that introductions from other countries have been made from time to time in the past.

It has spread throughout the drier parts of Australia and is found in towns and valleys and even on farms and stations in remote areas.

In this State it is prevalent in the Perth-Fremantle area, and is somewhat less prevalent in the surrounding areas. It occurs in Geraldton, Kalgoorlie and the East and West Kimberleys.

Fowl tick infestation causes fowls considerable discomfort, particularly at night, and the anaemia so produced may be quite severe.

In addition, it acts as the transmitting agent of a blood parasite which produce Spirochaetosis or tick fever. Spirochaetosis occurs wherever the tick is found, and as with tick fever in cattle, birds habituated to tick infestation are usually immune, but those introduced to a clean area quickly contract the disease and suffer high mortality.

THE DOG TICK

Another tick of importance, fortunately not in this State is the dog or "paralysis tick." It is confined to the coastal area, along the northern and eastern coasts of Queensland and New South Wales, parts of Victoria and Tasmania, and is restricted to bush and scrub country.

It commonly occurs on certain native fauna, particularly bandicoots, but it is not indigenous to Australia, as it occurs also in New Guinea, Indonesia and parts of India.

Domesticated animals are really accidental hosts, and whilst it most commonly attached itself to dogs, it has been found not infrequently on cattle, sheep, goats, horses, pigs and cats, and also occasionally on poultry.

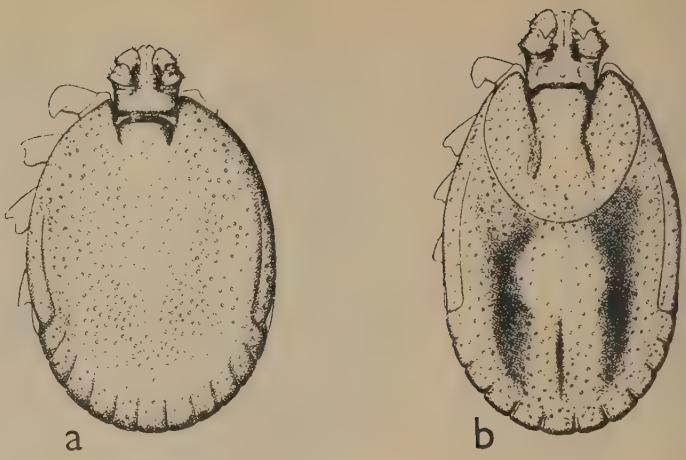


Fig 3.—The bush tick, (a) male, (b) female

Paralysis usually follows the attachment of female ticks and a single female is capable of causing paralysis and death in even a large dog. Large numbers of larval ticks may also cause paralysis and in man they may cause considerable local irritation and nervous prostration. Occasional deaths have been reported in children from mature ticks.

The nature of the agent responsible for tick paralysis has not been determined, but it is considered most likely that it is a nerve toxin generated by the salivary glands of the tick.

Whilst symptoms of tick paralysis may appear on the third day or even earlier from the time of attachment, they usually commence by the end of the fourth or beginning of the fifth day.

In a condition such as this which is not particularly amenable to treatment, prevention is most important, and in infested areas, a thorough daily search of dogs is most necessary.

A weekly bath, using some of the newer insecticides such as Gammexane and Dieldrin, have been found very effective, and such preparations are being used widely in the infested areas around Sydney, particularly on the North Shore, where the dog tick has been responsible for the loss of large numbers of dogs, for many years.

All in all, with the exception of the Kimberleys, Western Australia is fortunate in being free from serious tick infestation and it is to be hoped that this desirable state of affairs will continue.

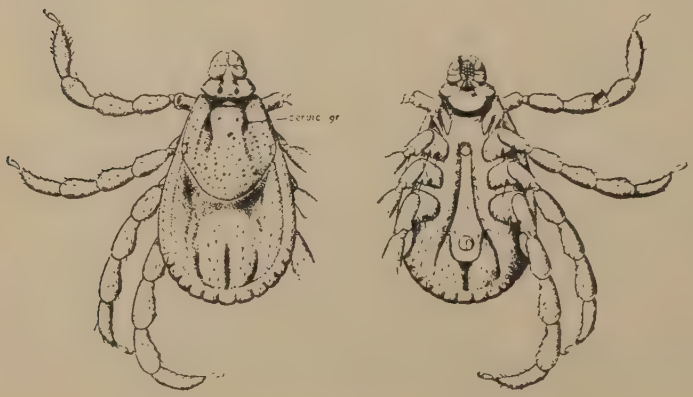


Fig. 5.—The brown dog tick (female)

WILD GOATS

By A. R. TOMLINSON, Chief Vermin Control Officer

I HEARD recently of an eminent citizen who awakened one morning to find a goat in the house, apparently determined to become a member of the family, and the adventures the householder went through in endeavouring to find the rightful owner are almost unbelievable. This is probably not entirely a new happening, but it served to remind me of the big expansion in goat keeping and breeding which has occurred over recent years.

Goats have been kept here since early settlement. Apart from their reputation for liking clothes on washing lines, and a preference for tin cans and other roughage, they were often the only means of obtaining fresh milk and meat in many remote mining and station centres.

Over recent years they have returned to popularity, and by the use of carefully selected breads have become a useful and valuable aid to the milk production industry.

Unfortunately there is another side of the picture. Although descended from goats which had been domesticated for centuries, those kept by the early settlers readily reverted to a half feral or completely wild state.

Many escaped from domesticity or were abandoned when the owners moved. They quickly established themselves in the scrub and are well distributed through the Goldfields and pastoral areas. While originally chiefly hill or mountain dwellers, wild goats can live off the open scrub and grassland.

It is well known from past history that wild goats will destroy much vegetation and cause extensive denudation and depletion with attendant erosion. Where populations are high enough they will kill out some vegetation species and by preventing regeneration of trees and scrub can cause untold damage. A well-known example was St. Helena on which goats were introduced in 1513, when the island was covered by a luxurious forest. By 1810 wild goats had reduced the island to a barren rocky waste. I have heard that Cyprus was threatened with the same fate until the pests were destroyed by the British.

In Western Australia, pastoralists and local authorities have recognised the potential menace of wild goats and they have legally been declared "vermin" in the Mullewa, Upper Gascoyne Meekatharra, Marble Bar and Port Hedland districts. Similar declarations have also been made for Bernier and Dorre Islands off the coast near Carnarvon, and the Recherche Archipelago out from Esperance.

Reports have been received of mobs in varying numbers all over the State but the biggest population appears to be in the Murchison and adjacent areas. I have been told of mobs of 500 to 600 roaming over stations in this vicinity. One owner said that over 5,000 had been destroyed on his station in five years, and they were still as bad as ever.

The main control measures are shooting or water poisoning using 1 lb. of soluble arsenic such as arsenite of soda or arsenic pentoxide in 60 or even 80 gallons of water.

As the mobs are fairly mobile it is essential that any control work should be organised on a front so that neighbouring stations are operating simultaneously. Action by stations individually, no matter how good, will only mean that many of the wild goats are moved from one place to another.

Over recent years there has been a trade for live goats shipped to northern countries, particularly Singapore. Hunters have rounded up thousands for export, while others have been destroyed for meat and skins. A South Australian firm recently indicated it was interested in obtaining about 100,000 a year for meat and hides, but is experiencing difficulty in arranging for operations on a big enough scale.

Unfortunately, these hunting campaigns, while getting rid of many thousands of goats, are not leading to permanent control and the overall situation is not improving. The hunters are interested in billy goats with a proportion of the larger nannies, so that there is always a sufficient residue left to breed up and replace those taken. In actual fact many of the operations are amounting to large-scale farming for which the stations are paying in depleted carrying capacity while not sharing in the profits.

My advice to station owners is by all means to let hunters operate but to make sure that some of their own men accompany them to destroy the nannies and kids. Above all, not to neglect water poisoning when the opportunity presents itself and in fact endeavour to make this the main controlling measure.

There is no Mystery about "1080"

By A. R. TOMLINSON, Chief Vermin Control Officer

DESPITE the widespread publicity given to sodium fluoroacetate or "1080" and its general use throughout agricultural areas, there appear to be many misconceptions regarding the poison itself, its control, dangers and precautions and also the method of application. I will mention several of the questions often asked and give the answers.

What is "1080"?

"1080" is manufactured as a very light, fluffy white powder to which we have a black dye added as a safety precaution. The powder is so light that great care must be taken in opening tins. It is extremely soluble and has no smell or taste. It is not cumulative but it remains poisonous until washed away and there are no satisfactory antidotes. It is also rather slow-acting and in general is an almost ideal poison for pest control.

How Does It Act?

"1080" is usually introduced by mouth but it is considered it could act through cuts or abrasions. The chemical itself is not poisonous but it is changed to another substance by the body and this substance is lethal. It has been reported that this new substance is not lethal if introduced direct but only if taken in the original form of "1080" and then converted by the body. This means that secondary poisoning by eating the bodies of poisoned animals results from surplus unconverted "1080". "1080" affects various animals in different ways which broadly speaking involve the brain or heart. Some animals such as dogs or foxes are remarkably susceptible, while birds generally require higher dosages varying up to 200 or 300 times more powerful.

Is "1080" More Dangerous Than Other Poisons Such As Strychnine?

Less strychnine or cyanide would be required than "1080" to poison a human being but these poisons can be detetected by taste or smell. In its original form "1080" is safe if handled properly but its extreme solubility, its lack of taste or smell and the absence of a reliable antidote make it dangerous if handled by untrained, inexperienced or irresponsible persons. Any person swallowing it would be completely unaware of its presence and, because of its slow action, it might be many hours before the first symptoms were noticed by which time it would be too late to do anything. We take elaborate precautions in handling the poison, such as using

large, transparent, airtight compartments for preparing field mixtures with special facilities for drainage as well as general security safeguards.

However, because of the small quantities involved, once "1080" has been added to bait it is probably less dangerous to humans and domestic animals, excepting dogs and cats, than other poisons.

Why Does The Agriculture Protection Board Prevent Farmers From Obtaining the Poison?

The answer is of course that the poison is controlled by the Public Health Department which restricts its use in the interests of public health and safety. That Department has ensured that the poison can be used by allowing its sale in prepared bait form and permitting trained Agriculture Protection Board officers to handle it. This aspect has already received so much publicity, and the question itself is really so absurd that I find it difficult to believe that it is intended to be serious.

How Can Farmers Have Bait Poisoned By Protection Board Officers?

The Board has a number of units which will visit properties mainly during organised destruction drives. They will poison and lay out bait for the farmers after the farmers have pre-baited with unpoisoned bait for at least three days. The units will leave some poisoned bait for farmers to use themselves later and, as our local Group Vermin Control Officers visit properties in the normal course of their duties—when units are not operating—they will also poison and leave bait. While our units are available in an area, no poisoned bait will be left for a farmer to use unless his property has already been poisoned by a unit. The reasons for this are very simple.

Firstly, because of the arrangements made with farmers to free feed and the general organisation of the work, our units and officers in the area are working to a very tight schedule which can be badly disrupted by interruptions. Secondly, when we are conducting a drive the main essential is to ensure that neighbouring properties are poisoned as near to simultaneously as possible. When our units do the poisoning we know that the work has actually been done but if we hand the bait to a farmer there is no way of knowing if he used it or when. We do know that some of those who demand poisoned bait to be left in this manner are the most unco-operative in doing any rabbit control at all. By the time the rush of organisational work relaxes sufficiently for inspections to be made of the property it is usually too late to ensure that the work was really done or that it was done in time to prevent any rabbits from reinfesting neighbouring properties which had been properly treated. Thirdly the charge we make for mixing is based on the fact that the unit or officer is already on the property for other reasons. If special visits were made for mixing, we would probably have to impose a minimum charge which would be almost as costly as having the whole job done.

Factors Affecting Air Consumption of Milking Machines

By G. W. SCOTT, Senior Instructor, Dairy Division

MILKING machine operation depends mainly on the removal of air from the machine piping and components by the vacuum pump. When a machine is new it is free from leaks, the pump is of the correct size and driven at a speed designed to give adequate displacement of air for efficient operation. The air requirements of different makes of machines vary considerably, and the layout and installation are important factors.

For instance, the volume of the air space between the teat cup casings and the inflations, the volume of the releaser spit chamber, the size of the claw air admission holes and the length of master pulsator lines where used, all have an effect on the

air consumption. Of these, the releaser spit chamber has the greatest effect and differences of up to 4 cubic feet of air per minute are noticeable between some makes of machines.

It is realised that features of design are beyond the control of the farmer, particularly after he has purchased the machine but if he has the necessary knowledge to make a wise selection he will find that the vacuum pump can be operated at a minimum speed so prolonging its life. Also, the efficiency of the machine during the waning period of the pump towards the end of its working life, will be greater.

The pulsator rate has a bearing on air consumption but while kept within the practical range of 45 to 48 cycles per minute the minimum volume of air is used in this section of the machine. The pulsator action as its name implies, is intermittent and it stands to reason that the greater the rate, the greater will be the air consumption as the function of the pulsators is to alternatively evacuate the space between the teat cup casings and the inflations, also the releaser spit chamber, and allow atmospheric air to return during the next cycle.

As a machine ages, it is quite common for leaks to develop due to normal wear and tear and the fact that some components become distorted through handling. At the same time the vacuum pump deteriorates and its displacement falls off. Therefore, as the air requirement of the plant increases, the amount of air available decreases.

It is necessary at this stage to stress that although a machine will show 15 in. of vacuum on the gauge while milking, it may have no reserve air and this can result in teat cups falling off or slow recovery to the 15 in. level after changing cups between cows.

Quite often farmers reduce the efficiency of a machine by the addition of extra milking units without taking into consideration the need for the extra air required to maintain efficient milking. If the vacuum pump size and its driven speed are correct for a certain sized machine, it stands to reason that an increase in speed at least will be warranted if further units are added.

In some cases farmers speed up the pump but do not correspondingly reduce the pulsator rate so that the advantage of the speeding up is partly lost.

If a decision is made to increase the size of a milking machine, either by straight-out addition or by doubling up, it is advisable to consult a milking machine mechanic and have the vacuum pump displacement checked in order to ensure that the air requirements will be met.

Apart from increasing the size of a milking machine beyond the capacity of the vacuum pump we can say that the factors contributing to insufficient available air for efficient operation are an inefficient or slow vacuum pump and air leaks in the machine.

If the pump becomes grossly inefficient it must be replaced or reconditioned. Unfortunately this is an expensive item and many farmers persevere with a worn-out pump for several seasons at the expense of decreased milking efficiency and considerable loss of time.

Air leaks are very common and in most cases inexcusable. Apart from worn out pulsators which are difficult to repair without special equipment it is a simple matter for a farmer to detect and rectify the general air leaks which are found on many machines and so improve the reserve air factor.

It is well to remember that air which is wasted through leaks has to be paid for in fuel and pump and engine wear, while at the same time the machine may be starved for reserve air.

It is strongly recommended that farmers should spend a little time periodically in checking for these faults.

Manganese deficiency in Vegetables . . .

By L. T. JONES, Senior Plant Research Officer

MANGANESE is one of the essential mineral plant foods. It is grouped with four other "trace elements," or "minor elements"—molybdenum, copper, zinc and boron, which are all needed in very small

amounts, but nevertheless are essential to the healthy growth of the plant. The most prevalent trace element deficiency with vegetable crops in the metropolitan area is that of manganese.

Soil Types Affected.

The solubility of soil managanese increases with increasing soil acidity. To the market gardener this means in practice that, in strongly acid soils, manganese is frequently present in toxic concentrations and may cause crop failure, while on a naturally "limey" soil or a heavily-limed soil, manganese is rendered unavailable and therefore manganese deficiency may be induced in the more susceptible crops.

It is therefore logical to find that in practice manganese deficiency with vegetables does not occur on acid swamps except after they have been heavily limed, but that it is quite common on the "marly" or "limey" swamps. It is also quite common on sands containing limestone. However, managanese deficiency often occurs on the non-calcareous or slightly acid sands near Perth, and also it is frequently induced under these soil conditions by heavy applications of lime.

Response of Susceptible Crops.

In the vicinity of Perth the most susceptible crops appear to be beetroot, parsnip, cabbage, cauliflower, runner beans, tomato and pumpkin.

Chemical analyses of the leaves of these several crops have confirmed the initial diagnosis of manganese deficiency from leaf symptoms. Investigations have shown that usually a manganese content in the leaves of less than 15 parts per million on an oven-dry basis indicates that the plant would respond to manganese sulphate applications.

Control Measures.

Manganese deficiency is controlled by the use of commercial manganese sulphate (which costs approximately £85 per ton) either as a soil application or as a foliage spray.

A. Soil Application:

When applying manganese sulphate as a soil application for vegetable crops it is usually recommended to apply between 56 and 112 lb. per acre when broadcast. When the manganese sulphate is concentrated in a furrow or in a band, much lesser quantities are found to be equally effective. Experience with widely-spaced crops like cauliflowers and tomatoes indicates that 10 to 20 lb. per acre of manganese sulphate is an adequate dressing. In some cases it has been been found that it is difficult to control manganese deficiency by soil applications, but effective control has been obtained in these instances from the method of foliage spraying.

B. Foliage Spray:

Foliage spraying is a more economical use of managanese sulphate than soil applications. The method is very effective and the risk of spray damage is practically negligible. From our experience we recommend a 1 per cent. spray consisting of 10 lb. of manganese sulphate in 100 gallons of water and preferably with the addition of a "spreader" for better leaf coverage. When a spray of this concentration is used it is not usually necessary to give a second application. The normal rate of foliage spraying in vegetable crops would be about 100 gallons to the acre, so that a 1 per cent. foliage spray would supply 10 lb. of manganese sulphate to the acre.

The spray is most successful when the plants are fairly young but marked responses have been obtained when the plants were more than half way through their growing period.

Commercial manganese sulphate often contains a small quantity of insoluble material and it is usually advisable to remove this material by decantation or sieving to avoid the problem of blocked nozzles and frequent stoppages for cleaning.

Diagnosis from Leaf Symptoms.

Because manganese deficiency is so readily controlled, it is profitable to be able to recognise the leaf symptoms at an early stage so that immediate treatment can be undertaken and crop losses avoided.

The function of manganese in the plant is thought to be concerned with chlorophyll formation and hence, when managanese is deficient, leaf yellowing is a common symptom. Some plants like

parsnip, show a striking leaf pattern of green veins with yellowing between the veins. Other plants such as cabbage show a general mottled yellowing of the leaves. Beetroot show triangular or spear-shaped leaves with the edges curled forward as well as a yellow mottling with small dead patches, giving the leaf a typical speckled appearance. These symptoms are so distinctive in this species as to be commonly called "speckled yellows."

Care and Maintenance of HIVE MATERIAL

By A. C. KESSELL, Apicultural Section

WHEN assembling new equipment every care should be taken to see that the material will last as long as possible. The initial preparation of new equipment determines the length of its life; therefore, we can safely say that care and maintenance start from the beginning.

With new hive bodies it is recommended that all the dovetailed edges be dipped in red lead, and assembled while still wet.

This can be achieved by having two trays. One contains red lead primer diluted with linseed oil for easier penetration. The second tray is used to stand the timber to drain for a few minutes before assembling.

Nail every joint at each dovetail with 2½ in. nails and for a really first-class job punch all nails and fill with putty.

Apply red lead primer inside and outside the box not forgetting the edges at top and bottom.

When dry, metal rabbets are securely nailed in position, and the supers are then painted with an undercoat on the outside, again including edges. The boxes are later finished with two coats of finishing paint outside and in.

An alternative method and one which is now being tried by several beekeepers is the use of water-suspended resin sealer in place of primer and undercoat.

The sealer is diluted 1 to 4 and all new materials are dipped before assembly. The normal finishing coats are applied over the sealer.

As for the finished colour, white, off white, stone or similar colours are satisfactory. One that is proving very popular is the aluminium based type.

I have mentioned painting the inside of boxes. It has been found that condensation in the hive is absorbed into the hive timber especially in the case of new material. This could be the cause of rotting at a later date.

Our next consideration is the bottom boards. If made of timber or masonite they should be treated for painting with the same procedure as that for supers.

The underside of the boards should be treated with a termite deterrent and wood preservative.

There are several types of arsenical and pentachlorphenol preparations available that can be diluted with water or kerosene, and easily applied. They dry quickly after treatment and can be ready for use within 24 hours without objectionable odours to the bees.

The underside can then be painted if required.

Bottom-boards made of galvanised flat iron are becoming increasingly popular. They require no painting but it is advisable to treat the cleats to discourage termite attack.

These bottom-boards have all the qualities of timber but an indefinite period of service and do not require costly maintenance.

Lids should be strongly constructed because they have to stand up to rough usage. The cavity type lid with ventilation holes is perhaps the best as it permits upper ventilation in summer and winter. Whatever material is used in way of pine or masonite for covering the lid frame, it is always a good plan to cover the top with galvanised flat iron bent down over the edges and nailed.

To avoid depressions in the centres of lids, several sheets of newspaper can be added between the lining and iron top before nailing the iron in position.

A support bar across the underside of the lid prevents the strapping from distorting the lids. Solder all nail-holes to prevent pulling. Lids should be painted inside as it is here that most of the condensation accumulates. Painting can be carried out on the same lines as mentioned previously.

Although the lid is finished with galvanised iron on the top, the temperature of the iron can be reduced in summer by 10° to 15° by painting with one coat of aluminium based paint.

Don't wait for the paint to peel and timber to show through before attempting maintenance. Using aluminium based paint it is only necessary to rub the boxes down with a cloth or paint brush and apply the paint direct. One coat is usually sufficient.

When boxes have peeled badly it pays to bring them back to the workshop, rub them down to remove flaking paint and apply an undercoat followed by a finishing coat.

Progeny Testing and Artificial Insemination

By R. A. BETTENAY, Agricultural Adviser, Dairy Division

ONE of the major difficulties in operating an artificial breeding service is the procurement of bulls which will get daughters of high yielding capacity. Proving of bulls is slow and impossible without herd recording data from the herds in which they are used.

There is only a small proportion of proved good bulls in artificial breeding centres throughout the world. The reason is that no really satisfactory method of proving bulls without the aid of artificial insemination has been evolved. This means that centres must prove their own bulls and this can only be done after some years of operation.

Under natural mating, many methods of progeny testing have been used in various parts of the world and the first and most obvious of these is the one which uses the average production of a group of daughters to give the worth of the bull. However this method does not take into account the level of management and feeding of the daughters nor the quality of the cows to which the bull was mated. Obviously daughters of a bull used in one herd, and which are well managed and fed, will out-yield daughters of a bull in another poorly managed herd, even if breeding is not as good.

The sire and dam contribute equally to the inheritance of a cow and consequently various techniques for comparing production of daughters and their dams have been evolved. These help to overcome the objection of herd differences as the daughter and dam were usually milked in the one herd. On the surface, a daughter-dam comparison technique is sound, but difficulties include that it restricts the number of eligible daughters to those whose dams were tested, and that either age corrections are necessary to bring the daughters production to maturity, or the comparison is made on records produced at the same age but in different years and the level of herd management may have altered in the meantime.

It is known that almost any bull can improve production in a low-producing herd and fewer bulls are able to lift production in a high-producing herd. With this in mind New Zealand workers have calculated expectancy tables showing to what extent the average bull might be expected to raise or lower production when mated to cows of various production levels. When the progeny test of a bull is available it can be compared to a table and he can be classified according to how far he is above or below the average.

All of these methods are open to criticism, with the consequence that the usually accepted progeny test is the one which shows the uncorrected average of daughters of various ages and it has been left to the prospective purchaser to assess the worth of the bull in the light of the figures and his knowledge of the herd and its level of management. With the advent of artificial insemination a much more accurate test can be obtained in that a

bull's daughter will be under test in a great number of herds covering all levels of management. Under these conditions it is quite satisfactory to compare a number of bulls kept at the one centre on the basis of the average production of daughters. It is generally accepted that, where a single lactation from each daughter is available, at least ten daughters are required for an accurate evaluation.

A calf-marking scheme has now been instituted in connection with the artificial insemination centre in this State and it is most desirable that all heifer calves born as a result of artificial insemination are tattooed so that they may be identified when they join the milking herd.

Finally for progney testing in association with artificial insemination to be carried out successfully it is essential that as many members as possible join a Grade Herd Recording Unit so that the production of tattooed heifers can be obtained.

Virus Pneumonia in PIGS

By I. J. MILLER, Veterinary Surgeon, Animal Health and Nutrition Laboratory, Nedlands

THROUGHOUT the world infectious diseases are a major factor limiting the full exploitation and expansion of the pig industry. In Australia, probably the most important single disease involved in economic loss is infectious or virus pneumonia.

From surveys conducted in Great Britain and in the other States of Australia, it has been assessed that 60 to 70 per cent. of porkers slaughtered, show lung changes indicative of virus pneumonia. It is safe to assume that a similar percentage would be found from the pig farms of this State.

As its name suggests, a virus is responsible for the primary pneumonia, but in many cases secondary bacteria are also present. These infective agents leave the respiratory tract in the form of droplets, which are expelled in large numbers during coughing or sneezing. This may be likened to the spread of the common cold or our recent "flu" epidemics.

In the majority of pigs infected, the changes produced in the lungs persist for months and even years. The virus, therefore, remains active and may spread throughout the entire piggery. Once the disease is established in a herd it tends to remain indefinitely, perpetuated by piglets becoming infected by their dams. Pigs from virus free herds, when introduced into an infected property usually develop the disease in two to three weeks.

The clinical picture may take an acute, or more frequently, a chronic form. When the disease is first introduced into a susceptible herd the effect may be dramatic. Pigs of all ages contract the disease and early mortality may be high; with the older animals often more severely affected than the young stock. In the surviving pigs the disease becomes chronic, and since there are comparatively few herds free from contact this is its usual form.

Following infection from the sow, piglets begin to show symptoms at three to six weeks of age. If the sow is free from disease, symptoms may be delayed until contact is made with other already affected weaners. The first obvious signs of infection are a slight diarrhoea and occasionally a rise in temperature. In a day or two a dry, non-productive cough develops, which is the prominent symptom. This is most marked in the early morning, but can be brought on by any period of vigorous exercise. The cough may disappear after some weeks or may persist indefinitely. In addition, the coat lacks its usual bloom and may show a greyish tinge.

Crowded conditions have a marked effect on the clinical evidence. This is most obvious when animals are housed under communal conditions and least obvious under isolated conditions. The severity of the disease may be offset by warm, draught-free housing and adequate rations.

Despite maintained appetites, affected pigs do not thrive as well as disease-free animals. In some cases severe stunting may result, but in most the effect is insidious and unrecognised. Therefore, the most important feature of this disease is

that infected pigs eat as much food but fail to utilise it efficiently—this is clearly shown by the fact that infected litters take a month longer to attain bacon-weight than do clean litters. There is no necessity to impress the significance of this on pig farmers as they know only too well the financial loss involved.

The popular belief that a coughing pig is a worm-infested one has no foundation. Without distracting from the undoubted value of worm-free pigs, the effects of lung worm and round worms are considered insufficient to cause persistent coughing.

The value of treatment in virus pneumonia is limited. Antibiotics will prevent the establishment of secondary infection, but have no effect on the virus itself. The difficulty of control lies in the inability to eliminate affected stock, as there is no specific test for symptomless "carriers." Also there seems little hope of a preventive vaccine being developed.

The affects of this disease may be minimised by good draught-free conditions, but absolute control can only be achieved either by total replacement with healthy stock, or by building up virus-free herds.

Although there are certain problems involved in the establishment of a virus-free piggery, various trials have shown it not only to be possible, but highly desirable to provide a source of virus-free stock.

THE LANDRACE PIG

By K. NEEDHAM, Dairy Cattle Husbandry Officer

MUCH has been spoken, written of and read about the Landrace type pig, but for practical purposes it is as well to say from the outset that our knowledge of its performance under Western Australian conditions is practically nil.

The Danes have for many years concentrated on the breeding and production of a high quality bacon pig and because of their success they have developed a very lucrative export bacon market particularly to the United Kingdom. The success of the Danes has resulted largely from the fact that they have endeavoured—by careful selection and breeding—to develop a type of animal which has the maximum of the highest-priced cuts and a minimum of waste. To put it another way the Danes have set out to breed a pig which most nearly meets the type and quality of cut which the housewife demands. Our information indicates that they have succeeded with their Danish Landrace. Let it be clearly realised that the importations to this and other states of Australia are the Swedish Landrace which is a different type to the orginal Danish model. Very wisely, in my opinion, the Danes decided that there is very much merit in the adage that when you are on a good thing you stick to it.

Accordingly they restricted the export of the Danish Landrace in the hope that they could retain without competition a position of superiority on the world bacon market. Like the plans of mice and men, something went astray and in time their neighbours the Swedes produced the Swedish Landrace which is similar in many respects to and undoubtedly derived from the original Danish Landrace. Representatives of the Swedish version made their way to Northern Ireland and in turn to Australia. So such therefore concerning the origin of the pigs which are currently causing so much interest.

What is it then that makes the Landrace type of pig so appealing to the producer, curer and consumer alike? Simply that under the environmental conditions in which it was developed and similar ones elsewhere it has demonstrated its ability to provide a long lean pig with well let down and nicely-rounded hams. The shoulders are light and fine, tapering away to a light head with the minimum of jowl. The colour is white and the ears are large and forward pointing. Legs are short, fine and strong. In fact it strongly resembles a Dachshund dog in general appearance.

Naturally pig raisers will be interested in the commercial performance of this type of pig under Western Australian conditions and, as we know nothing as yet, the Department is closely following all developments. One imported sow farrowed

just recently and we weighed the litter 16 hours after birth and again at three weeks. Subsequent weighings will be made at eight weeks and again at six months. Breeders are co-operating most willingly and it is our intention to follow through the bacon curers any of these animals or their crossbred progeny in order that carcass appraisals may be undertaken.

It is understandable that breeders who have been keen enough to import these Swedish Landrace will receive many inquiries from pig-raisers anxious to try out the breed. Bearing this in mind they are just as anxious as the Department that commercial pig raisers will avoid any programme of indiscriminate breeding which could bring discredit to the breed. Whilst crossbred sows will be used with discretion it is very important that no one should ever contemplate the use of a crossbred boar.

Whilst the Berkshires and Large Whites of the proper type and with correct management can produce and are producing ideal and profitable bacon pigs we are looking forward to seeing just what the Landrace can contribute to the industry and I hope that at a later date I will be able to tell you more of the progress which which has been made with this interesting importation.

Soil Fumigation for the Control of EELWORMS

By W. P. CASS SMITH, Superintendent, Division of Biological Services, Department of Agriculture

NOWADAYS, in popular horticultural literature the term "living soil" is frequently used. This term has been coined to emphasise, that the soil as a medium for plant growth, contains not only inert mineral particles, but also many living organisms which have a marked influence on soil fertility.

Some are decidely beneficial, while others are harmful parasites, and soil fertility largely depends on the balance between these two types.

Soil micro-organisms of this latter type include nematodes or eelworms which attack the roots of a variety of plants causing unthrifty growth and decline in yield.

There are many different kinds of eelworms which can attack plants, and they are now known to be very destructivie pests, either singly or collectively, in home and market gardens, orchards, vineyards, banana plantations and other areas.

Root knot is the best known eelworm-caused disease, and it is widely present in the sandy soils of our metropolitan area. It chiefly attacks ornamental and vegetable plants, producing obvious galls or knots on the roots.

Not so well known, but equally destructive, are the root lesion nematodes which are often damaging on fruit trees, vines and bananas. These tunnel through the roots causing them to rot so that the feeder root system is seriously depleted.

For many years the harmful nature of eelworm plant parasites was overlooked, mainly because they could not be controlled adequately, and therefore, the losses that they caused could not be fully estimated.

However, this picture changed very rapidly with the advent of D-D soil fumigant some years ago. D-D gave excellent control of many eelworm species and the increased yields which followed were spectacular.

Unfortunately the standard fumigants such as D-D or E.D.B. cannot be applied to growing plants as they are injurious to the roots.

For this reason they can only be used to fumigate soil before planting and are therefore chiefly of value for eelworm control in **annual** crops, e.g., vegetables.

For many years, there has been then, an urgent need for a fumigant which would control eelworms on the roots of established **perennial** plants without causing damage, and recently a material known as Nemagon was developed, which complies, it is claimed, with these specifications.

Since Nemagon became available for trial purposes, the Department has been testing it intensively on fruit trees, vines

and bananas to assess its effectiveness and the best methods of application. These trials are of a long-term nature so that it will be some time before we have all the answers.

However, as the preliminary results have been promising Nemagon has been registered provisionally in order that growers themselves can test this material without delay.

It is strongly recommended that growers who intend to do this, should first contact the Department, or their local Agriculture Adviser, for further information on this subject. It is also understood that present stocks of Nemagon are so limited that the usage of this material will be restricted initially to commercial growers only.

Farmyard EROSION CONTROL

By B. a'B. MARSH, Adviser, Soil Conservation Service

EVERY farmyard in the wheatbelt suffers from erosion. You can't go on to any farm without seeing unsightly bare areas, rills and even gullies around the farm sheds and house.

Of course, the farmyard doesn't produce the cash crops like the productive land in the paddocks, but it pays to keep the farmyard in good condition. The farmyard can contribute large quantities of quick flowing water, even in light rain, onto arable land and what is sometimes more inconvenient, this water finds its way into sheds. Dust blowing off the bare yard can be a serious inconvenience to the housewife. Travel inside the yard can be made uncomfortable and damaging to vehicles and machinery. A visitor's impression of a farm and the farmer's ability and efficiency can be greatly affected by the appearance around the farmyard, which is the first part of the farm he really notices, unless, of course, he nearly wrecks his car on the entrance track.

Let's work out why farmyards erode badly. Sometimes water from uphill runs into the area and causes erosion, but more often the area itself becomes bare and can run great quantitites of water. A three-acre farmyard can discharge as much as 3,000 to 5,000 cubic yards of water in a year.

PLAN CAREFULLY

The basic reason for farmyard erosion is lack of planning. A snap decision is usually made about the placing of a new shed or silo and an overall plan is seldom made. If a plan is made, it is likely to be drawn on paper with more regard for the points of the compass than the slope of the hill. No roads are made. Vehicles travel into the area and make direct tracks from one shed to another. Because there is no planned circuit, vehicles back and turn and eventually the whole area becomes bare due to wheel traffic and loss of water along vehicle tracks. Servicing of farm machinery is often carried out where the machine happens to be parked and vegetation is killed and soil deteriorates with spilt oil and petrol; dieselene used for washing parts is often thrown out.

Most farmers cope with this problem by trying to control the runoff after it accumulates, instead of preventing the runoff. Contour drains or even steeply-sloping drains are built in an effort to divert runoff. This doesn't work; vehicles flatten the banks out and also, when runoff water is checked by a drain, the water slows down enough to drop a load of silt and sand and this blocks the channel.

Runoff can best be controlled by prevention, this can be done by growing grass. This is only possible if vehicles are kept on special tracks. Formed roads for this purpose have special advantages. They keep vehicles off the grass, they intercept runoff water, they allow water to run off vehicle tracks into the side drains where it can be picked up by spur drains for safe disposal, they give a comfortable smooth ride, they give the visitor a good impression of the farm and the farmer. If taken in a complete circuit into the farmyard, past the house and sheds and back to the gate, there is no backing and turning necessary. If formed roads are

given a slope in the right direction, water from outside the farmyard can be easily diverted.

The steep-sided cut at the side of the formed road can be left in order to discourage vehicles from leaving the road except where access to sheds, silos and farm tracks is required in which case the drain sides are smoothed off.

A sharp corner can be provided near the house to prevent vehicles from speeding and raising dust.

In front of sheds there should be an apron or tarmac sloping to the road drain. This area can be used for backing and turning machinery and machinery maintenance where daylight is required for easier working.

With a basic planned road circuit sheds can be added inside or outside the area with little likelihood of adding to erosion hazard. With establishment of clover or grass and perhaps trees, the area can be beautified and fires need not be a worry as the formed roads can be an effective firebreak.

King Karri no Longer Reigns Here

A dairy farm carved out of the karri forest near Pemberton. Despite the apparently rich loamy soil of the karri areas, settlement presented many problems as stock failed to thrive. The remedying of trace element deficiencies, mainly cobalt and copper, wrought a transformation and these properties are now highly productive.